DEVELOPMENT, GROWTH, AND STATE OF THE ATOMIC ENERGY INDUSTRY

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BEFORE THE

JOINT COMMITTEE ON ATOMIC ENERGY

CONGRESS OF THE UNITED STATES

EIGHTY-FOURTH CONGRESS

SECOND SESSION

ON

DEVELOPMENT, GROWTH, AND STATE OF THE ATOMIC ENERGY INDUSTRY

PART 2 OF TWO PARTS

Comments on Report of the Panel on the Impact of the Peaceful Uses of Atomic Energy

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FEBRUARY 29, MARCH 1, 5, AND 6, 1956

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DEVELOPMENT, GROWTH, AND STATE OF THE ATOMIC ENERGY INDUSTRY

WEDNESDAY, FEBRUARY 29, 1956

CONGRESS OF THE UNITED STATES,
JOINT COMMITTEE ON ATOMIC ENERGY,
Washington, D. C.

The Joint Committee met at 2 p. m., pursuant to notice, in the Old Supreme Court Chamber of the Capitol, Senator Clinton P. Anderson (chairman of the joint committee) presiding.

Present: Senators Anderson (presiding), Pastore, and Gore; and Representatives Durham, Price, Cole, and Hinshaw.

Chairman ANDERSON. The hearing will be in order.

I want to thank the Chairman and the members of the Commission for responding to our invitation for comments on the Report of the Panel on the Impact of the Peaceful Uses of Atomic Energy. Chairman Strauss, we will be happy to have you handle this in any way you see fit.

STATEMENTS OF LEWIS L. STRAUSS, CHAIRMAN; DR. W. F. LIBBY, MEMBER; THOMAS E. MURRAY, MEMBER, HAROLD S. VANCE, MEMBER; K. E. FIELDS, GENERAL MANAGER; WILLIAM MITCHELL, GENERAL COUNSEL; W. K. DAVIS, DIRECTOR OF THE DIVISION OF REACTOR DEVELOPMENT; HAROLD PRICE, DIRECTOR OF DIVISION OF CIVILIAN APPLICATION; AND DR. THOMAS JOHNSON, DIRECTOR, DIVISION OF RESEARCH, ATOMIC ENERGY COMMISSION

Mr. STRAUS. Mr. Chairman, the entire Commission is before you with the exception of Dr. Von Neumann who unfortunately continues to be indisposed and who telephoned me this morning to request that I present his respects and his regrets.

We are glad to have this opportunity to comment on the Report of the Panel on the Impact of the Peaceful Uses of Atomic Energy. The McKinney committee was probably as distinguished a group of citizens as has ever been impaneled for such an assignment, and they conducted their work with great diligence and thoroughness and, as the result has demonstrated, without any bias or prejudice. On page 102 of their findings, the panel has stated that "Commissioners and the Commission organization have reason to be proud of the Commission's accomplishments." The Commission appreciates this statement and other statements in the report.

We have given study and thoughtful consideration to the findings and recommendations of the panel although, of course, its report was months in preparation and we have had it only a matter of weeks. Therefore, our study is a continuing one.

Some of the recommendations of the panel had been initiated by the Commission before the report was made, such as the declassification and distribution of technical information. We reported on this during the recent 202 hearings, and I am glad to be able to say today that the review of the backlog of pertinent documents accumulated from the days of the Manhattan District to the present time has been completed. The resulting declassification and lowering the grade of classification of these documents will be reported to you in due course.

In the field of international cooperation the panel has made a number of interesting recommendations which will be considered in the light of the recent approval by the President of the Commission's recommendation to make 20,000 kilograms of fissionable material available for the development of power reactors in friendly nations.

We have prepared brief comments on the recommendations of Mr. McKinney and his colleagues. I understand that you wish to have this presented orally, which we are prepared to do.

If that is your pleasure, I would like to ask Commissioner Vance if he would present the first section on atomic power. These comments have been divided into sections corresponding to those in the McKinney Panel Report.

Chairman ANDERSON. I am not trying to confine you to reading it all. It would be unfortunate if everything that is obviously a very sincere and substantial effort were put into the record without reading it. Therefore, when your discretion suggests that something can be skipped and inserted in the record without reading, there will be no objection on my part at least.

Mr. STRAUSS. I will discuss that with my colleagues and the General Manager and if we can identify such portions we will request that.

Representative COLE. I would like to fix in my mind, Mr. Chairman, first to what extent the Commission collaborated and concurred in the comments which are being presented today. Is there any disagreement or minority viewpoints? I would like to find out ahead of time just how unanimous the Commission is on its attitude toward the panel.

Mr. STRAUSS. Before I respond to that I believe Commissioner Murray has a statement he would like to make, Mr. Cole.

Mr. MURRAY. I think, Mr. Cole, it will be evident that some of the comments that are about to be read are not compatible with the power program I recommended last week. But with the exception of such comments I endorse this Commission's statement here this afternoon.

Representative COLE. Thank you. I am glad to have that understanding.

Mr. STRAUSS. Will that answer your question, Mr. Cole?

Representative COLE. Yes, it does.

Mr. STRAUSS. Thank you.

Chairman ANDERSON. Proceed, Mr. Vance. I believe this is probably the first presentation you have made before this committee. We are very happy with your membership on the Commission and very pleased to have you participate here today.

Mr. VANCE. Thank you, Mr. Chairman.

The panel's first recommendation is:

That the Congress, the American people, and the people of the world recognize that large sums of money and years of effort must be spent to bring atomic power to a point where it can be used effectively and widely on a competitive basis; unless and until research and development demonstrate that atomic power can be economically feasible, there can be no substantial impact.

The Commission agrees with the panel's conclusion as to the present status and future prospects of atomic power.

The panel's recommendation No. 2:

That, in the event that industry does not take on the full risks and burdens, the Commission should support a program to bring atomic power to a point where it can be used effectively and widely on a competitive basis, even to the construction with public funds of one full-scale "demonstration" plant of each major reactor size and type.

The Commission, with the qualifications Mr. Murray has already made, is presently committed to support a program to bring atomic power to a point where it can be used effectively and widely on a competitive basis.

As a simple matter of economics, until the use of atomic energy as a source of electric power is reasonably competitive in cost with the use of conventional sources, we cannot expect extensive use of private capital to exploit it for commercial purposes.

Competitive costs for the use of atomic power are not in immediate prospect although it is our hope and expectation that further technological progress will accomplish this goal.

Meanwhile, emphasis should be on research and development, and it is in this area that Government funds can be most profitably employed. The test of whether or not Government funds should be used for full-scale atomic power installations should be whether or not the individual project is truly applied research in character, whether or not it will contribute measurably to the art and bring us closer to the goal of making atomic energy competitive as a source of power, and whether or not private funds are available for the purpose.

Present indications are that industry can be relied upon to assume a substantial portion of the risks and burdens involved in achieving this objective. We expect that industry will assume the primary responsibility for development beyond the experimental plant stage. If industry does not do this, some additional public funding may be necessary.

The extent of additional public funding cannot be readily defined at this early stage of development. Many factors must be considered in deciding whether to construct prototype plants. We think it would be premature to decide at this time to construct with public funds a full-scale plant of each of the major reactor types. The results of the present experimental program might eliminate certain reactor concepts and add new ones.

Furthermore, Government funds should not be used for full-scale power installations, merely to enlarge the use of atomic energy for power purposes, while such use is commercially uneconomic as it is today.

Representative COLE. What is your intention of procedure, or your plan of procedure? Is it to wait until this entire presentation is completed and then return for comments?

Chairman ANDERSON. Without objection on anybody's part here in the Commission, I would like to have full freedom for the members of the committee to break in at any point. I do not see how they can remember all their questions until the testimony ends.

Representative COLE. Since the Commission's presentation is point by point, it would seem to me we might interrogate at the conclusion of each point, if you wished. If that is agreeable, I would like to ask Mr. Vance, referring to the panel's recommendation that the Commission embark on a program of—

Construction with public funds of one full-scale "demonstration" plant of each major reactor size and type.

If you are able to give me an estimate, Mr. Vance, would you tell me just how many types and sizes of major reactor plants there might be, which the panel has recommended be constructed with public funds, in the event that private capital is not available?

Mr. VANCE. I believe eight, sir, with some variations from them.

Representative COLE. Is that generally the agreement of the Commission, that there are at present only eight concepts of major reactor plants?

Mr. VANCE. Eight major concepts.

Mr. STRAUSS. May I amplify that to this extent, that there are other concepts that are present in the military, which might conceivably, and I think in all likelihood, will in the course of time become applicable for civilian use.

Representative COLE. Well, then, would you explain or clarify in my mind the significance of Dr. Zinn's expression that there was a whole wagonload of types of reactors? Dr. Zinn, in my book, is about as expert as there can be in the field of reactor experiments. If there is a wagonload of types of reactors, to me, that is an imponderable number.

Now, the Commission says there are only eight.

Mr. STRAUSS. Eight under present development and study. There probably are as many types of reactors as there are reactor specialists in the field, Mr. Cole. You have heard that said, I know, many times.

Representative COLE. Now, what type of reactors do you suppose the panel meant? Were they referring to these eight which are now under consideration by the Commission, or any one of the conceivable types of major types of reactors?

Mr. STRAUSS. I think it would be impossible to interpret what the panel had in mind, but it might be reasonable to assume that they were referring to those of which they had heard from the Commission, and those would be those presently under consideration.

Representative COLE. How many of the eight major types does the Commission now have programed for construction, either through exclusive private capital, exclusive public capital, or combination?

Mr. STRAUSS. I would like to ask Dr. Davis, the head of the Reactor Development Division, to answer that, with your permission, Mr. Chairman. I have the list here but he can do it much better than I can.

Mr. DAVIS. Well, there are eight general classes of reactors. Of these, we have programed as prototypes the pressurized water reactor as one of the major classes. In addition to that there is Yankee and

Consolidated Edison, and the Belgium reactor which will all be of this type. Boiling water reactors is another major type. Commonwealth Edison is planning to build such a reactor.

Aqueous homogeneous is a class of reactors. I think this is where part of Dr. Zinn's statement comes from, since there are many different possibilities with respect to homogeneous reactors. Penn Power & Light announced their intention to build one type of this class of reactor.

Sodium graphite is another major class and Consumers Power District is planning to build a full sized prototype. The fast reactor is another one of our eight classes and here, the Power Reactor Development Co. have announced their plans to build a major reactor of this type.

This again has several different possibilities, where you would fuel with plutonium or U–235, with the various possibilities here.

The other types of reactors would be the liquid-metal fueled reactor, the organic-moderated reactor, gas-cooled reactor, and these are types which are still in the early stages of development. We do not yet have any plans to build essentially prototypes of these reactors except for the proposals by some of the utilities under the second round, where they did propose to build in one case a liquid-metal fueled reactor, an organic-moderated reactor, and in a third case a gas-cooled gas-turbine reactor.

Representative COLE. That will be eight major concepts which have been given serious approval and sonsideration by the Commission. Five are already underway, either by the Commission or by a combination of private capital?

Mr. DAVIS. Yes, sir.

Representative COLE. And 3 of the 8 remain undetermined and the reason for the fact there has been no action is because of the uncertainty, and the research on them has not been completed.

Mr. DAVIS. It is simply getting started now, and it has not progressed very far at all.

Representative COLE. But is it true then that there are presently aggregates of capital, private capital which are considering embarking on these other three types?

Mr. DAVIS. I mentioned the second round and these are proposals which envision a great deal of Government assistance in general. There are, however, in each case private manufacturing companies which are backing up the proposals, and whom we presume will carry some of the load of the development work. But insofar as making very large scale prototype reactors out of these, I don't believe that anyone would consider that this is timely. We simply have not gone far enough in the development.

Representative COLE. Of the 3 which are now under way, do any 1 of them have Federal participation, financial participation?

Mr. DAVIS. Of course, in the case of the PWR, the pressurized water reactor, it is built, insofar as the reactor is concerned almost exclusively by the Government. In the case of the Consumers Public Power District, the Power Reactor Development Co. and the Yankee Atomic Electric Co.—they all have some measure of Government participation.

Representative COLE. Identify the one that has no Government participation.

Mr. DAVIS. The one that would have no Government participation at the present time is the Commonwealth Edison one, which is the boiling water reactor.

Representative COLE. And the other four?

Mr. DAVIS. Excuse me, the Pennsylvania Power & Light homogeneous reactor also has no Government participation.

Representative COLE. Two out of the three now under way, are financed by private capital, and the remaining three have Federal participation in varying degrees?

Mr. DAVIS. That is right.

Representative COLE. From a relatively negligible amount up to 100 percent of it, for the reactor part of it?

Mr. DAVIS. Something of the order of 90 percent.

Senator GORE. I would like to address a question to whomever is the proper one to answer it. Mr. Davis, you have said that five are under way. What do you mean by the term "under way"? Is it under way in the proposal stage, or in the construction stage?

Mr. DAVIS. Well, none of these, with the exception of the pressurized water reactor, are yet in the construction stage. The others are in varying stages of study and design and negotiations with the Commission, in the case of Commission support. It is a little hard to describe except in each individual case what the stage is. But none of them have actually begun construction, this is true.

Chairman ANDERSON. Well, the bids were taken and proposals were taken April 1, 1955. This is March 1, 1956, today. Has anything been finally done under the proposal of Commonwealth Edison?

Mr. DAVIS. Well, Commonwealth Edison was a proposal made under the power demonstration reactor program, and one which did not involve any Government participation. So they have asked instead, simply for a license to construct and operate this reactor.

Chairman ANDERSON. Has it been granted?

Mr. DAVIS. The license has not, I believe, been granted.

Chairman ANDERSON. No. 2, is Consolidated Edison of New York. It is under the license feature, also, is it, or not?

Mr. DAVIS. Consolidated Edison is under a straight license, too.

Chairman ANDERSON. Has it been granted?

Mr. DAVIS. I do not believe that a license has been granted.

Chairman ANDERSON. And the next is Detroit Edison. It is under what kind of a program?

Mr. DAVIS. Detroit Edison, that is the Power Reactor Development Co., that is under the power-demonstration program.

Chairman ANDERSON. Has any final decision been made on its application?

Mr. DAVIS. Well, they are applying here for assistance from the Government as well as for a license.

Chairman ANDERSON. But they applied in April of 1955, and has it been completed as yet?

Mr. DAVIS. We are still negotiating the contract with them, and we still have not granted them a license.

Chairman ANDERSON. And the Consumers group in Nebraska, they filed before the April 1 deadline?

Mr. DAVIS. That is correct.

Chairman ANDERSON. And what is the status of their negotiations?

Mr. DAVIS. We are still negotiating the final details of the contract with them.

Chairman ANDERSON. So that your term, "Underway" means underway still with the Commission. Is that right?

Mr. DAVIS. I think it means a great deal more than this, because in each case the manufacturers concerned are taking very positive steps to bring these reactors into being. For example, the Commonwealth Edison plant is a boiling-water reactor and the General Electric Co., who are their contractors, have established a laboratory in California and they are proceeding to carry out development work, and detailed design work on this reactor. I think this is certainly underway.

Chairman ANDERSON. Has any ground been broken?

Mr. DAVIS. No ground has been broken that I know of on the actual construction of the reactor itself.

Chairman ANDERSON. Except for Shippingport?

Mr. DAVIS. That is right.

Senator PASTORE. Well, along the lines of Mr. Anderson's questioning, then will you please explain for the record why the license has not been granted?

Mr. DAVIS. I prefer to have the Licensing Division reply to that, sir.

Representative COLE. It was explained at our meetings 2 or 3 weeks ago.

Mr. PRICE. We covered that, Mr. Chairman, but I would be glad to go over it again now, though. The two companies that have applied for licenses for facilities which they will completely finance without any Government assistance are the Commonwealth Edison Company of Chicago, and the Consolidated Edison Company of New York.

Chairman ANDERSON. Dr. Davis did not mention that, and I thought that the president of Consolidated said he was not going to require Government help.

Mr. PRICE. That is right. It was an oversight, I am sure. They are the two. Now, those people as Mr. Davis said, are doing developmental and experimental work. The G. E. Co. is doing some work on the Commonwealth plant out in California. The Babcock & Wilcox Co., who will build the Consolidated plant, is setting up facilities at Lynchburg, Va. They will have to run some critical assemblies. That is to run some tests.

Now, so far as their license is concerned, under the law they won't get that until the facility is completed and ready to operate. In the meantime, they will need a construction permit. We have worked with them on the construction permit and we are at the point where we have given them a draft of a construction permit for their comment, and I would guess in a matter of weeks, they will get it. However, it is not holding up their breaking ground, because it will be a matter of months before they start digging for the actual plant.

Senator PASTORE. You have answered my question.

Mr. STRAUSS. To the extent, Mr. Chairman, that the plant at Lynchburg which has been mentioned as having been a facility of Babcock & Wilcox, is a plant antecedent to 1 of these 2 large reactors. Ground has been broken for that. I am informed that is well along in its construction.

Mr. PRICE. That will be not only an experimental facility but it will be a facility for fabricating the fuel elements for the Consolidated plant. They started construction last year, and I suspect they have nearly finished the plant.

Chairman ANDERSON. Then they started without regard to the application of Consolidated Edison?

Mr. PRICE. They started after they made the arrangement with Consolidated Edison. They started construction, I am sure, last year, and I believe it is well along.

Senator GORE. The last sentence read by Commissioner Vance appears to need some clarification. He read as follows:

> Furthermore, Government funds should not be used for full-scale power installations merely to enlarge the use of atomic energy for power purposes, while such use is commercially uneconomic as it is today.

Commissioner, what did you mean by saying that they should not be constructed merely to enlarge the use of atomic energy for power purposes?

The reason I ask that question is this: I have heard no one who has advocated the use of Government funds for the construction of power facilities saying that it should be done merely to enlarge the use of atomic energy for power purposes. Those advocates of that kind of a program, including Commissioner Murray, have suggested that other purposes including the public interest would be served.

Mr. VANCE. I think that is merely to point up the statement earlier in the comment on this recommendation. That is, that the test on installations of this kind should be whether or not they will materially contribute to the progress of the art and help us along to the goal of where the use of atomic energy for power purposes is economical.

Senator GORE. Well, the words you just used are much broader, Mr. Commissioner, than the words you read in your statement. If it is to facilitate the art of atomic power, then that is not "merely to enlarge the use of atomic energy for power purposes."

Mr. VANCE. Well, I think one, sir, is a confirmation of the other.

Senator GORE. I respectfully cannot quite see the similarity between the two. Your language here is very restrictive. You say it should not be used merely to increase the supply of electricity, and your answer now takes in a much broader field, the development of the art and the demonstration of methods?

Mr. VANCE. That is right.

Senator GORE. With those purposes I would agree, but I could not agree with the restricted statement which you last read.

Mr. VANCE. Well, I submit, Senator, that one statement confirms the other. One is simply a reverse of the other.

Senator GORE. Do you think that Government funds should be used for the construction of full-scale power installations?

Mr. VANCE. I think it depends on whether or not the installation is likely to measurably contribute to research and development toward the goal that we are familiar with.

Senator GORE. Then, if it does that, you would favor it?

Mr. VANCE. If it does that and private funds are not available, I would; yes, sir.

Senator GORE. Then your statement just read is more restrictive than your personal position?

Mr. VANCE. I do not think that you can take one sentence out of a complete statement unless you relate it to the statement as a whole.

Senator GORE. I am certainly not trying to take anything out of context. I think that you have explained your position fairly well. Your personal position as you have just stated it, if I understand it correctly, is that if the construction of a large-scale atomic power facility for which private funds were not available would aid in the development of atomic power you would favor it?

Mr. VANCE. Would measurably aid.

Senator GORE. All right. Thank you, Mr. Chairman.

Chairman ANDERSON. Mr. Vance, in this paragraph, you say that it is premature, or the Commission thinks it is premature, to decide at this time to construct with public funds full-scale plants for each of the major reactor types. When would it be possible to make a decision as to whether industry will take on full risk and move with this program?

Mr. VANCE. I did not get the point, there, Mr. Chairman.

Chairman ANDERSON. How long do you think the delay should be before there is a decision as to whether industry is going to get to this? How long would it be reasonable to wait?

Mr. VANCE. Well, Senator, it seems to me that with these eight or more different types of power reactors now in the process of development, with no current firm information as to which type offers the best commercial possibilities, I think until there is some indication that one or more of these types holds the greatest promise for commercial exploitation, we are not in a position to determine how much a full-scale installation will contribute to the art, whether it be financed by public funds or private funds. Personally, I believe that is one of the reasons why private capital is waiting for that particular point to develop.

Now, you ask me when. Possibly 2 years, or maybe sooner.

Chairman ANDERSON. You think the program should stay in abeyance for 2 years, and if private capital has not moved in 2 years then the Government might move?

Mr. VANCE. Insofar as Government funding of full-scale operations are concerned, yes, sir, I do.

Chairman ANDERSON. Even if you felt that the insurance question was going to prevent private industry from getting into this?

Mr. VANCE. I think in this interim period there may very well be individual situations which have to be weighed on the question of whether or not they will contribute measurably to the research and development program which is going on.

Senator PASTORE. Could I ask a question at this point? If the Government is not going to invest money of its own on the building of reactors until such times as it becomes commercially economic, then how can we ever hope that private industry will do it?

Mr. VANCE. Well, Senator, I think that there are two types of reactors. There are reactors where the principal purpose they serve is further research and development, and there are other reactors which are commercial in type. It is the latter type of reactor that I am addressing my remarks about.

Senator PASTORE. Well, the thing that I am trying to straighten out in my mind is this: Is this the point where Commissioner Murray is at odds with the remainder of the Commission? Am I right, Mr. Murray? Do you feel that at this point, Government money

should be invested in building the reactor even though it is not now commercially economic?

Mr. MURRAY. After you make the determination that it is in the public interest to get on with this job, and that the job is an urgent job to be done. You have to make that determination first. If we have plenty of time to get on with this reactor job, then what we are doing now is perfectly all right and what Mr. Vance is recommending is perfectly all right.

Senator PASTORE. You mean it is all right up to this point to decide it only until it is established that it is practicable?

Mr. MURRAY. I think so, but you must, with all due respect, make the determination that it is in the national interest that we get on with the job on an urgent basis. Otherwise, my recommendations that I have made do not stand at all.

Senator PASTORE. The point I am making is this: Are you at variance with the remainder of the Commissioners on this point that is raised on this page 3 as pointed out by Senator Gore?

Mr. MURRAY. It all depends on whether we have to do this job in a hurry.

Senator PASTORE. Who is going to decide that?

Mr. MURRAY. I think the men who are in front of me today, and others, similar men will decide that.

Representative COLE. Which way are you looking?

Mr. MURRAY. I am looking all over, Mr. Cole, from one end to the other.

Representative COLE. Are you referring to the Commission or to the Congress?

Mr. MURRAY. I think to the Commission and to the Congress.

Representative COLE. I wanted the record to be sure what you meant.

Mr. MURRAY. Oh, yes.

Senator PASTORE. Now, Mr. Murray, if you include the Commission too, then, do you not disagree with this part of the Commission's statement?

Mr. MURRAY. At the very opening here, I said that I agreed with this complete statement except insofar as it did not concur in my recommendation that I made last week. I said that, Senator, I think, before you came in.

Senator PASTORE. No, I was here when you said that. I am trying to pinpoint now at this point whether or not this is one of the parts of the Commission's statements that you are at variance with.

Mr. MURRAY. Oh, yes.

Senator PASTORE. That is the only question that I was asking. You are of a mind that the Government should begin to invest its money in building reactors if it is in the public interest to do so, even though at the present time it is commercially uneconomic to do it?

Mr. MURRAY. Yes, sir.

Senator GORE. May I ask a question there. You did not, did you, Mr. Commissioner, restrict your recommendation to the objective of merely enlarging the use of atomic energy for power purposes?

Mr. MURRAY. No, sir.

Senator GORE. You had specifically in mind the demonstration of purposes of efficiency of types, and the ultimate facilitation of the entrance of private enterprise into the field?

Mr. MURRAY. I did, Senator.

Representative DURHAM. Mr. Chairman, I have a question here. Suppose that some firm would come in here and make application for a reactor which is already designed at the present time. It did not make any difference about the cost, and he decided he wanted to build it. Would the Commission be together on that and let him go ahead and build it at his own expense? I received the impression that you would not even recommend that type of reactor regardless of who paid for it.

Mr. VANCE. Mr. Durham, I would like to make this further comment on what Senator Pastore was asking Mr. Murray about. It seems to me that the determination of whether or not a given reactor installation, whether large or small, will measurably contribute on the art, has to be made in each individual instance, and I do not think that you can make a generality of it.

Representative DURHAM. Mr. Vance, I am speaking to this point, of course, that if this individual concern, whoever it may be, Babcock & Wilcox, or any of them, feel like they can take a chance on this, regardless of the cost of the power and want to build it, the Commission would not say, "No, you cannot build this reactor," would they?

Mr. VANCE. Of course not.

Representative DURHAM. That is the point in this thing. If somebody wants to break through this thing and spend his money, that is all right. But I receive the impression that you just did not want to make any recommendation on a reactor at the present time regardless of the cost.

Mr. VANCE. No, sir. The point under discussion is——

Representative DURHAM. I know the point you made before.

Mr. VANCE. It is the extent to which Government funds should be used in building a large scale reactor.

Senator PASTORE. In the case given by Congressman Durham, you would not put a nickel in that venture?

Mr. VANCE. Depending on the character of it, of course.

Chairman ANDERSON. There is no Government money going into Consolidated Edison. They applied for a license before last April and they cannot get one now.

Mr. VANCE. I would like to say this in further explanation of this test of whether or not a contribution is made to research. I think in any line of research and development, that operating experience does work back and contribute to research and development, and that that is why the question can be decided only on the individual situation.

I do not think, for example, that to qualify in this test the reactor would have to be of a different type from any previously approved or previously operated reactor. It might be the same type or a very slight variation thereof. Yet it might conceivably produce value as a result of operating experience that would make an investment on the part of the Government worthwhile.

However, I again repeat that you cannot generalize in a situation of that kind. You have to judge each individual case.

Senator PASTORE. Now, do you feel, Mr. Vance, that that attitude will in any way slow down this program?

Mr. VANCE. No, sir, I do not think it will, because I think that the program is paced by progress in the technological field. That is the basis.

Senator PASTORE. What you are actually saying is that we are not so far above the research stage that we ought to begin to talk about making these reactors for purposes of producing electricity until we have perfected the art?

Mr. VANCE. That is right.

Senator PASTORE. And know where we are going.

Mr. VANCE. I hope that point is just around the corner.

Chairman ANDERSON. Britain is going ahead, and does that mean that they are ahead of us in technological art?

Mr. VANCE. No, sir. I think that their situation is quite different.

Chairman ANDERSON. Why?

Mr. VANCE. I think if Britain had oil reserves comparable with ours, I think if Britain had coal reserves comparable with ours, they would not be engaged in the reactor program they are now pursuing.

Chairman ANDERSON. You think then the fact that they are short of coal and have these other lacks in their economy, permits them to go ahead with the construction program that may result in high-priced atomic energy, but they need the energy so bad?

Mr. VANCE. They have certain economic pressures that we do not have. Fortunately, we do not have those.

Senator PASTORE. What about the export market? What is the export market? If they have a domestic need for accentuating their program, would they not beat us in the race in the export business?

Mr. VANCE. You mean the export of equipment?

Senator PASTORE. The export of reactors. If they build a reactor that will produce power only because that production cost may be slightly higher than our cost, because we have the abundance of coal and oil, yet, there may be the need for that particular reactor in some other country that is not in the same position as we are. Do we not lose the foreign market?

Mr. STRAUSS. Senator Pastore, may I remind you that the British reactor is a part of their weapons program. It is in that respect quite different from our reactor. They are dual-purpose reactors.

Chairman ANDERSON. You think that they are building these because of weapons requirements? Sir John Cockroft gave quite different testimony.

Mr. STRAUSS. Plutonium is represented to be an important product of the two reactors which are expected to be completed this year and next.

Chairman ANDERSON. But they have six following those, and is it your testimony it is because of the weapons program?

Mr. STRAUSS. I don't know about the six that follow. I do not know what kind of reactors they will be. I can only speak with respect to those I have seen. They are plutonium producers and power producers, and our reactors, those with which we are engaged, are power only. I might also say that when I came into the room this afternoon, I received word of an announcement which is to be made tonight or tomorrow indicating that two more private companies are going to build a reactor and they are going to begin it now, as soon as the license is issued, entirely privately financed, which they hope to complete in 1957, the power to be sold to the public.[1]

[1] The reactor referred to is to be built jointly by Pacific Gas & Electric Co. and the General Electric Co. near San Francisco.

I hope that announcement will be ready for our session tomorrow morning.

Representative COLE. To get back to Dr. Davis again, to clarify what now appears to be a confusion in the record with respect to the pariticipation of private capital in these various types of reactors, now that you have had an opportuntiy to reconsider, Dr. Davis, what are the reactors and the sponsoring companies of the reactors which have no Federal participation?

Mr. DAVIS. Apparently I said this incorrectly, but Consolidated Edison, Commonwealth Edison, and Pennsylvania Power & Light are all building large-scale reactors without any Government assistance.

Representative COLE. Now, can you give me the aggregate private capital that will go into those three conversion-type reactors?

Mr. DAVIS. We have a chart here which I do not know that you can see.

Representative COLE. I can read the bottom figure, but it is only $500.

Mr. DAVIS. These are millions of dollars, sir. These are the three reactors here.

Representative COLE. The reporter cannot read from what you are holding there. Read to me what it says so he can get it, too.

Mr. DAVIS. What this chart shows is that for these 3 reactors, the total investment by industry in the construction of the reactors, which does not include the private research and development going into them, is a total of $145 million. That is for these completely privately financed reactors.

Representative COLE. $145 million so far has been indicated to be ready for investment in exclusive private enterprise in a conversion type of reactor.

Mr. DAVIS. Yes, sir.

Representative COLE. 12 months' time. I am not at all encouraged by that kind of investment or gamble. Nobody knows how these things are going to turn out. If private capital is ready to step up and invest $145 million, you might encourage it. Tell me how much private capital is represented in the other two conversion type reactors in which there is also Federal participation.

Mr. DAVIS. There are 3 of these, sir. This is where the confusion arose before, because 2 of them are the same. In the pressurized water reactor being built by Yankee, the fast breeder being developed by the Power Reactor Development, and the sodium graphite by Consumers Public Power, and including an estimate now of 7 reactors under the second round, the total investment by industry would be $110 million, and the investment by Government $55 million, or only one-third of the total.

Representative COLE. I started out my inquiry by looking at the five unique types. You are bringing in, I fear, other projects beyond the five. I will start anew.

Actually all in all, is it not correct that the Commission has before it, either actually under construction or by way of consideration, a total of 12 applications for reactors, some of which are novel and some of which are duplicates; is that not correct?

Mr. DAVIS. Yes, sir.

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Mr. STRAUSS. That is right.

Representative COLE. Can you give me the aggregate of private capital reflectd in those 12 applications?

Mr. DAVIS. $255 million.

Representative COLE. Private capital?

Mr. DAVIS. Yes.

Representative COLE. Part of it is already in the offing, so to speak?

Mr. DAVIS. Yes, sir.

Representative COLE. How much public capital is represented in those 12 projects?

Mr. DAVIS. $55 million.

Representative DURHAM. When will power begin flowing from those three where there is no Government participation?

Mr. DAVIS. I am sorry. I did not hear you.

Representative DURHAM. When will they begin producing power in those three in which there is no Government participation?

Mr. DAVIS. The Consolidated Edison and Commonwealth Edison are now scheduled to go in operation by 1960 and the Pennsylvania Power & Light reactor by 1962.

Chairman ANDERSON. How far along is the Pennsylvania Power & Light? Are they not following a process at Oak Ridge? If it works out the way they think it will work out, they will make an application. Is that about right?

Mr. DAVIS. They are undertaking, themselves, in addition to the work being done at Oak Ridge, a very large private industrial development program. They hope that as a result of this program by 1958 they will then be able to begin the detailed design of this reactor.

Chairman ANDERSON. They have not started the design of the reactor as yet?

Mr. DAVIS. They have not started the actual construction and design of this reactor.

Chairman ANDERSON. That is 1 of the 3 that is underway?

Mr. DAVIS. That is certainly underway in the sense of a large-scale development effort with a very firm objective.

Representative COLE. Let me observe, I don't see how anybody, no matter how impatient he can be to get along with this program, can be critical of a situation in which it is apparent that $300 million worth of public and private capital is apparently ready to move into this brandnew unexplored field, involving risks of varying proportions and of the $300 million apparently available, only a fifth is from public funds. For every dollar of public funds that is being put into this venture so far, $5 is private capital. I take great encouragement from that situation.

Senator PASTORE. I am encouraged, too, but here we are met with a situation where the President of the United States announced only the other day that a half billion dollars worth of U–235 was being made available for export in international cooperation on peaceful uses of atomic energy. It strikes me if we can give away a half billion dollars for the fuel, maybe even this quarter billion dollars may not be enough.

Representative COLE. I didn't understand the President to say it would be given away.

Mr. STRAUSS. It is not to be given away.

Senator PASTORE. It is sold or leased. If we take the past as an example, much of it will be given away.

Representative COLE. The past extended over the last 2 or 3 years.

Senator PASTORE. The point I mean to make is that it is an imposing figure—the figure that has just been stated—but when we realize what we are up against, and this is an expensive field to begin with, relatively speaking the mere fact that this approaches maybe a third of a billion dollars or almost a half billion dollars is not as cataclysmic as some people want to think.

Mr. STRAUSS. I think it is due to the fact that statements have been made that private industry is not doing anything. There is a difference between nothing and $250 million.

Representative COLE. Would you clarify the cost of this material the Sentor has referred to? I have seen it priced in the paper at anything from $500 million to $2 billion. Will you tell us authentically and finally what is the value of the material that is made available?

Senator PASTORE. I am anxious to know, too. I read it as $1 billion.

Mr. STRAUSS. The Commission fixed a value for the uranium 235, which would be sold or leased and announced it in Geneva last summer when most of you gentlemen and several of us were present at $25 a gram, which was a price calculated to make no profit for the Government, but return to the Government the cost of the material, the cost of processing it, the amortization on plants which had been constructed for the purpose, and interest on the public money which was involved.

The figure of 40,000 kilograms, of which 20,000 was designated for use in domestic powerplants, and 20,000 for eventual allocation to approved powerplants in friendly countries, aggregated $1 billion by simply multiplying $25 by 40,000. The present purpose, unless there is some change in it—and there may very well be, as you have pointed out—is that it shall return to the Government that amount of money.

Senator PASTORE. That may be true, not that that bothers me, but it does concern me somewhat. Here we are offering to the world market for lease or sale, an item that is to be used as a fuel that is worth a half billion dollars. Am I correct in that?

Mr. STRAUSS. Yes, that is right.

Senator PASTORE. After all, that fuel will be of no consequence or of no help to anyone unless you build a reactor to burn it in.

Mr. STRAUSS. That is right.

Senator PASTORE. The British, as we have said here, because they feel a need for more development and research in this particular field naturally are getting into this field much more than we are. Certainly the Russians have almost made a crash program out of building reactors for the production of power. Realizing all these facts, I am wondering if somehow we had not ought to get into the thinking of Mr. Murray, who says we ought to declare a public policy and get on with this job, if private industry cannot meet the responsibility on its own, because we all admit that in the United States of America it will not become commercially feasible before it might become so in other countries. In that period, or within that range, we are apt to lose the foreign markets and end up only by selling the fuel and losing out

the markets of building reactors to the United Kingdom and Russia.

Mr. STRAUSS. Let us examine the question of whether the foreign markets are being lost. The only reactor that I know of that has been sold by any country to another country, other than the swimming pool reactor that we sold to Switzerland, is a reactor which the Westinghouse Co. has taken an order to make for the Belgians. That is to be wholly financed by Belgium.

We understand that American & Foreign Power has negotiations underway with three Latin American countries for reactors and at the present time we have not been approached by any country so far as I know to supply them with fuel for a reactor and the cost of the reactor as well. We have indicated that we would put up a power reactor in the Far East in connection with the general program of a research organization in the Far East. I know of no country that has been selling any reactors in the world except ourselves.

Senator PASTORE. Do you now take the position that insofar as that is concerned, we are pretty much on the safe side of this whole problem?

Mr. STRAUSS. I would hate to say on the safe side. I think we are well in the lead, and we will maintain it aggressively.

Senator PASTORE. The reason I take it up, Mr. Strauss, you will recall when we were in Geneva, there was a great deal of gossip—only gossip—that other nations were there solely and strictly for the purpose of selling these reactors, and many of our businessmen were disturbed about it.

Mr. STRAUSS. We have been unable to find that those fears were justified by anything that happened there.

Senator PASTORE. I am glad to hear that, and I hope it never happens.

Mr. STRAUSS. I would hope that there will be a good deal of business done by other countries in the reactor market and we will get our fair share of it.

Representative PRICE. Mr. Strauss, if after 2 years the industrial participation program does lag, and it is apparent that we are not going to meet the goal that was set for the industrial participation program, then what happens?

Mr. STRAUSS. It is a hypothetical situation that I don't have any idea will ever occur, Mr. Price. I believe that industrial participation will be generally ahead of what we presently anticipate.

Representative PRICE. You hope it will be, but you have no control over it. You have no control over the target date.

Mr. STRAUSS. I don't know of a target date, sir. We have very concrete evidence that private industry is coming into this field. I mentioned a few moments ago a forthcoming announcement. There will be others. I don't believe that 2 years ago the Commission or your committee anticipated anything like the degree of development that has occurred. I can assure you that I did not.

Representative PRICE. I agree with you on the development, but we did anticipate the industrial participation, because we had the study group for many years. We anticipated that these companies would be interested enough to continue in the program.

Mr. STRAUSS. The Commission issued a statement in the spring of 1953 which you will find in your records that does not bear that out. There was a good deal of pessimism about the fact that industry would step up to bat and take this enormous responsibility with stockholders'

money at this time. I have been frankly surprised and delighted to find it happen.

Representative PRICE. I don't think anyone would want to minimize the importance of the industrial participation program. I think it is a fine thing. I certainly have been for it ever since you started the industrial study group program. I think you have to resolve the national policy in regard to the power program, and whether or not there is any international significance or psychological effect of absolutely maintaining the lead in the power-reactor program. Then you have to determine whether or not you will be able to maintain that lead and hold it, merely through this one program, or whether it might not be necessary for a government crash program.

Mr. STRAUSS. Let me go back in history a little bit.

Representative PRICE. I would not for a minute want to interfere with the industrial participation program.

Mr. STRAUSS. Look how it has grown. Only a little over a year ago the plant at Shippingport, when it got underway, received a contribution—we were the beneficiaries of a contribution of $5 million—from the Duquesne Light Co. toward the nuclear part of that plant. The Westinghouse Co. agreed to forego its profit. I think they figured it would amount to half-a-million dollars. At West Milton, N. Y., the General Electric Co. has installed and is operating at no cost to the Government a turbogenerator to produce electricity from steam from an experimental reactor.

From that point on, private participation has increased to the point that we have these three large proposals that Mr. Davis has outlined to you, wherein not a penny of Government money is to go in, although the companies that are engaged in this operation know perfectly well that it is not economic at this time. I think it is a remarkable demonstration of the progressiveness and the courage and the pioneering spirit of private industry.

Representative PRICE. I agree with you.

Mr. STRAUSS. And should be complimented.

Representative PRICE. I am also greatly concerned about being absolutely certain that America maintains its lead in the atomic power reactor program. Of course, do we have a national policy in regard to that?

Mr. STRAUSS. We think we have in the Commission to the extent that we are in a position to establish a national policy. If we are supported by you gentlemen, it is a national policy. If we are not, it is just ours.

Representative PRICE. Do you put complete and sole reliance in the one program to maintain the lead?

Mr. STRAUSS. I don't know what you mean by one program.

Representative PRICE. The industrial participation program.

Mr. STRAUSS. We have a program of our own for smaller reactors. As you know, these reactors become more economic the larger they are; that is to say, the greater the output in kilowatts. For small reactors, such as might serve small cooperatives and small communities, or for export; or all the reactors that serve the armed services, the Commission has a very active program almost entirely Government-supported.

Representative PRICE. I was just thinking of the psychological effect if Russia someday announces that they have come up with the

first 100,000-kilowatt atomic powerplant. We know that they did come up with the first 5,000.

Mr. STRAUSS. No, sir; we have had powerplants operating long before that.

Representative PRICE. Not a strictly atomic powerplant for the purpose of producing power as the Russians have.

Mr. STRAUSS. I am sure you will recollect the plant at Arco that was built for the *Nautilus*, which was a powerplant.

Representative PRICE. That was for the atomic submarine reactor.

Mr. STRAUSS. The Russian plant was built for what?

Representative PRICE. For power.

Senator PASTORE. That is what they said.

Mr. STRAUSS. We have no evidence that that power is used for anything.

Representative PRICE. I thought we had evidence that it did supply the immediate area around the plant. I thought that was demonstrated to us at Geneva. If I am wrong on that, I would like to be corrected.

Mr. STRAUSS. I did not see such a demonstration.

Representative PRICE. That was the impression I had from what was shown to us at Geneva. I didn't hear any of our people there say otherwise.

Mr. STRAUSS. We had an atomic powerplant delivering power since the summer of 1953.

Representative PRICE. How much power, and to whom?

Mr. STRAUSS. The amount of that power is a classified figure, as you know, but it is the prototype of the reactor on the *Nautilus*. That was started, I believe, in late July or August of 1953.

Representative PRICE. Let us clear up the matter of the Russians' 5,000-kilowatt plant. Do they have such a plant?

Mr. STRAUSS. I have no reason to doubt it, sir.

Representative PRICE. Dr. Libby, you saw the demonstration at Geneva. Do you feel that that was strictly propaganda?

Dr. LIBBY. No, I believe they have the plant. They have shown it to a number of visitors. I am not so clear, sir, about the question of the disposition of the power. They did claim it was being distributed in the community, but it was noted by some of the visitors that there was a standby coal section. Probably this is for keeping the station going while they refuel the reactor. Just how much of the power is used in the immediate neighborhood, I don't know.

Representative PRICE. You have a standby power facility for the *Nautilus*, too?

Dr. LIBBY. Surely.

Representative PRICE. My concern is that we do hold and maintain this lead. You gentlemen have that responsibility. I hope you will pursue the right course to see that we do hold that lead.

Representative VAN ZANDT. I would like to explore the British development to date. We have heard a lot saying that the British are ahead of us. Admiral, is there anybody with you today who knows the British picture?

Mr. STRAUSS. I don't know exactly how to answer that. They have been very frank in disclosing their situation to us. We have exchanged information on these unclassified matters. I hate to engage

in a comparison simply because I don't think there is much to be gained from that.

Representative VAN ZANDT. Have they any reactor at the present time that is critical?

Mr. STRAUSS. Power reactor?

Representative VAN ZANDT. Yes.

Mr. STRAUSS. No, but they expect to turn one on for power purposes in October, a part of the Calder Hall plant.

Representative VAN ZANDT. How many are they building at the moment?

Mr. STRAUSS. I don't know. Personally I know only the Calder Hall plant, and up in the north of England the Downreay. I can get you an answer, I am sure, as to the number.

Representative VAN ZANDT. They are building two. Do you know when they might be turned on as you mentioned a moment ago?

Mr. STRAUSS. I am told that half of the Calder Hall plant will be in operation in October.

Representative VAN ZANDT. October of this year?

Mr. STRAUSS. I am told so. That is not official information. I have simply read it somewhere in the press.

Representative VAN ZANDT. They have announced they are going to build how many more—five, is it?

Mr. STRAUSS. I can't answer. Five or eight or something of the sort over the period of the next several years. Mr. Davis says 12.

Representative VAN ZANDT. What type of reactor, Dr. Davis?

Mr. DAVIS. I should like to make a point here. The Calder Hall type reactors are built as a part of their production program, and are under the direct supervision of the UK Atomic Energy Authority. They are building 2 reactors that they call Calder Hall A, and it is 1 of these that will go in operation in October.

In addition to this plant, consisting of 2 reactors, it is my understanding they are building 3 additional plants identical to the first plant which they call Calder Hall A. In addition to that, they have something quite different, which is their civilian power program, which is to be constructed by their electric authority, where the authority will build the plant and sell the plutonium to the Atomic Energy Authority, which will purchase the power. The Calder Hall plants are considered prototypes for these later civilian power reactors the first ones of which will not go into operation until 1960 or 1961. They have planned to build 2 of these at the start, followed by 2 more about 18 months later. It is my understanding that they are thinking now of increasing the civilian power reactors.

Representative VAN ZANDT. Does private industry in England participate in this program at all?

Mr. DAVIS. The way private industry participates is that they depend upon the manufacturers to build the plants under competitive bidding. The plants when built will be owned and operated in the case of the Calder Hall type reactors by the UK Atomic Energy Authority. In the case of the civilian power program reactors by the Central Electricity Authority. Those are public bodies.

Representative VAN ZANDT. It is a government monopoly.

Mr. DAVIS. All electric power in England is a government monopoly.

Representative VAN ZANDT. In other words, we in this country by permitting or inviting private interests to take part in the program

are probably several years ahead in making this program a free-enterprise one.

Mr. STRAUSS. I think we are certainly ahead with respect to the technology. I think that by bringing in private enterprise we will get cheaper power reactors more quickly. I think this will show up in the end to our advantage.

Representative VAN ZANDT. That is all, Mr. Chairman.

Mr. STRAUSS. Mr. Chairman, I would like to hand to you, but not to place in the record unless you prefer to have it, a list of the reactor situation as follows. Reactors acquired by countries abroad, under contract by countries abroad, bids received from countries abroad, active negotiation with United States industry, and discussions with United States industry. One country has acquired one. One is under contract. There are bids from three. Active negotiations with 8, and discussions with 15 countries.

Senator PASTORE (presiding). Would you want that made a part of the record?

Mr. STRAUSS. I think perhaps not, sir. My statement, as far as the numbers are concerned, yes, but I would like not to have the names of the countries in the record of this hearing.

Representative COLE. I would like to make an observation which was suggested by Mr. Strauss' comment with respect to the degree of accomplishment in such a short time. Do you recall that in the summer of 1953, 2½ years ago, when we were considering the need for revising the law in such fashion as to make it possible for private capital to participate, there was considerable concern among the members of the committee—I am sure you will all remember—that many of us felt that in view of the apparent lack of private interest in the movement, why should the Congress go to a great effort for the purpose of revising the law if there was no great demand for it? The decision was finally made by the committee that we would revise the law anyway, because we would be subject to the charge of being responsible for failure for private capital to get into the program because the law would not let them. So we changed the law anyway.

I think many of us did it with our fingers crossed, doubting very much the extent that private capital would move into this field. There was great doubt 2½ years ago. Here now in the beginning of 1956 we find evidence of over a quarter of a billion dollars of private capital is apparently ready to go ahead. I am very, very much encouraged.

Let me point out if it is not a fact that of the $50 million of the Federal participation in these dozen projects, is it not true that $30 million of it is in 1 project, the Shippingport project, approximately $30 million?

Mr. DAVIS. That does not include the Shippingport reactor. The Shippingport reactor is a total of something like $90 million of Government financing.

Representative COLE. Then I misunderstood your figures. What I saw was the total investment in reactors now under construction or now under consideration. You said $250 million. In matching that $250 million there was a public total of $55 million.

Mr. DAVIS. We spoke first about the entire industrial ones, and next the primarily industrial ones with Government support. We have the pressurized water reactor in Shippingport here under the column

of primarily Government support with only a small amount of industrial support.

Representative COLE. Why don't you put that in the record, and if anybody wants to clarify it, they can do it. I am satisfied with what you have given us.

(The information is as follows:)

DEVELOPING CIVILIAN ATOMIC POWER

GOVERNMENT'S EXPERIMENTAL PROGRAM	SCHEDULED FOR OPERATION	POWER DEMONSTRATION PROGRAM	SCHEDULED FOR OPERATION	INDEPENDENT INDUSTRIAL PROGRAM	SCHEDULED FOR OPERATION
		FIRST ROUND			
Shippingport, Pa. Pressurized Water Reactor 60,000 KW Westinghouse and Duquesne for AEC	1957	Rowe, Mass. Pressurized Water Reactor 134,000 KW Yankee Atomic Electric Co.	1959	Indian Point, N. Y. Pressurized Water Reactor 150,000 KW Consolidated Edison Co.	1960
Lemont, Ill. Experimental Boiling Water Reactor 5,000 KW Argonne National Laboratory	1956	Monroe, Mich. Fast Breeder Reactor 100,000 KW Power Reactor Development Co., Inc. (Detroit Edison Co. & others)	1960	Dresden, Ill. Boiling Water Reactor 180,000 KW Commonwealth Edison Co.	1960
National Reactor Testing Station Experimental Breeder Reactor 15,000 KW Argonne National Laboratory	1958	Nebraska Sodium Graphite Reactor 75,000 KW Consumers Public Power District	1959	Eastern Pennsylvania Aqueous Homogeneous Reactor 150,000 KW Pennsylvania Power and Light Co.	1962
Santa Susana, Calif. Sodium Reactor Experiment 7,500 KW North American Aviation for AEC	1956	SECOND ROUND			
Oak Ridge, Tenn. Homogeneous Reactor Experiment 2,000 KW (equivalent capacity) Oak Ridge National Laboratory	1956	Elk River, Minn. Boiling Water Reactor 22,000 KW Rural Cooperative Power Association	1960		
National Reactor Testing Station Organic Moderated Reactor Experiment North American Aviation for AEC	1956	Gainesville, Fla. Pressurized Water Reactor 2,000 KW University of Florida	1959		
Los Alamos, N. M. Molten Plutonium Reactor Experiment Los Alamos Scientific Laboratory	1959	Piqua, Ohio Organic Moderated Reactor 12,500 KW City of Piqua	1960		
Los Alamos, N. M. Power Reactor Experiment I & II Los Alamos Scientific Laboratory	1958	Hersey, Mich. Aqueous Homogeneous Reactor 10,000 KW Wolverine Electric Cooperative	Unknown		
Liquid Metal Fueled Reactor (Contractor not selected)	Unknown	Anchorage, Alaska Sodium Cooled-Heavy Wtr. Moderated 10,000 KW Chugach Elect. Assoc., Inc. Nuclear Development Corp. of Am.	1961		
Gas Cooled Reactor (Contractor not selected)	Unknown				
		Orlando, Fla. Liquid Metal Fueled Reactor 25,000/40,000 KW City of Orlando	1960		
		Holyoke, Mass. Gas Cooled Reactor 15,000 KW City of Holyoke	Unknown		
		PROGRAM COSTS (in millions)			
GOVERNMENT	$231.7		$ 84.7		-0-
INDUSTRY	$ 20.2		$110.1		$143.0

The cost of the Government's Experimental Program is the estimated cost of all work from July 1, 1953 through completion of the projects listed. This cost includes the fabrication of cores but excludes the cost of special nuclear materials.

The cost shown for the Power Demonstration Program is based on proposals submitted to the AEC, including modifications through February 2, 1956. This cost excludes the fabrication of cores and the cost of special nuclear materials. Cost included for the Second Round is preliminary and incomplete.

The cost shown for the Independent Industrial Program is based on estimates attributed to the sponsoring utilities.

DIVISION OF REACTOR DEVELOPMENT FEBRUARY 2, 1956

Senator PASTORE. I want to say in answer to Congressman Cole that I think he is one of the best informed men on this committee. He has been with it from the start. I have the highest respect for any opinion he expresses with reference to this subject. But the thing that disturbs me is that, while it is true we have been talking about

these millions of dollars, I don't think these millions have been committed. A lot of time remains between now and when we are going to begin to see the actual fruits of this program. While it is true that these plans have been submitted, no groundwork has been broken. I suppose it is a program that must proceed very slowly. But it has to be constantly watched. I think myself when you are living in an economy where a matter is not commercially economical, and the people, the directors, have to invest stockholders' money, that does not happen too easily, especially in cases where you have public utility companies that are under State supervision.

When we read about these nationalized countries like the United Kingdom and a regimented country like Russia, where the top man decides how much is going to be invested in such a program and it is done, we have to constantly be on the alert that we are not outdistanced in this race. Our approach may be different. The thing that disturbs me more than anything else, while we talk about a quarter of a billion dollars, not much has been spent in constructing the facilities.

Mr. STRAUSS. The same healthy skepticism was felt before the Shippingport plant went through its ground breaking and early construction stages. That involves, as I pointed out a few moments ago, $5½ million of private capital for the nuclear part, and that plant is well up in the air. I have seen progress photographs about once a month. It will be under roof very shortly.

Representative COLE. I am quite sure Senator Pastore and Mr. Durham will recall that in the summer of 1953, when we were sort of looking over the ground, there was not a single company officially who would come up and say, "My company is ready to put X million dollars in." They all equivocated and hesitated. Now we have several companies that have come up and said, "My company is ready to put it on the line." True, they have not done it. But at least they have expressed a readiness to do it, and that to me is something.

Chairman STRAUSS. The plant at Lynchburg which I referred to a few moments ago represents a substantial investment on the part of the contractors who are engaged in the preliminary work on the Consolidated Edison plant. I don't know how many millions are involved there. Do you know, Mr. Davis?

Mr. DAVIS. Not offhand.

Mr. STRAUSS. Several.

Mr. FIELDS. Could I speak to this point a moment? Ever since the receipt of the proposals, these companies have been going through organizational activities within themselves, reaching their commitments, even going to seek their financial structure and organizational structure. We have had many meetings in the reactor hazards reviews in their conceptual proposals and designs. They are expending money. I do not have the exact amount on any particular ones of them. But they do have engineers and scientists and technicians working on these matters in order to bring to focus their designs so that they can be reviewed.

In the case of Commonwealth Edison and Consolidated Edison, this has been through numerous reviews, and we have now reached the stage where shortly we will be giving them a construction permit. We crossed the hurdle that they can locate these plants at the sites they propose. Very shortly we will be giving them approval of this.

So there has been a considerable bit of activity of this nature that is taking place.

Senator PASTORE. Let we ask this question of the members of the Commission. Are the members of the Commission satisfied that we are making reasonably good progress in this deal?

Mr. STRAUSS. I think, Senator, you might get the answers from the individuals. I will say that I will never be satisfied. It is chronic with me.

Senator PASTORE. Then let me ask you this question, Admiral. Do you think that there is something that we can do that will help us to feel better satisfied?

Mr. STRAUSS. It may very well be, sir, that in the course of the next weeks or a month or so that we may come to you and talk to you about the insurance situation if we cannot work it out an an independent basis. But at the present time I know of nothing that I would want to advance in respect of legislation. I would like, since you addressed this question to the Commission, to have my colleagues have an opportunity to reply.

Senator PASTORE. If they care to. Dr. Libby?

Dr. LIBBY. I certainly agree that industry response is very heartening. I think there is an aspect to this whole problem which should be brought out in our discussion. The critical matter in the development of atomic power, I believe, is not money nor uranium, but it is technical manpower necessary to solve the problems. These men are in large part employees of private industry. So even if we proceed with a Government-financed program, we still have to get these companies to build the plants in order that we get the men they have on their payroll to work on them.

It seems to me that we get a more wholehearted effort if we do have a company with its money on the line, its reputation at stake, and its whole interest in the development of the project. I am not in any way criticizing our industrial contractors in any part of our program. We have had wonderful service from them. But I think it is still true that the men of highest ability who are in great and vital demand for the country's normal business are more likely to be brought to bear on the atomic power program if the company has its own money in it.

This is one feature of the program I wanted to bring out. It is an important one from my point of view. I like to see the companies enter into the wholehearted or at least a full partnership with the Government.

However, if it should develop that some aspects of our program should lag, then I believe we should go ahead with public funds. But I think we can wait a while on this. The signs look very good. I am very encouraged.

Senator PASTORE. Mr. Vance, do you care to comment on this point?

Mr. VANCE. I don't think I am competent to discuss this particular question. I am too new on the Commission.

Senator PASTORE. Mr. Murray, in the absence of a new declaration of public policy, how do you feel about the progress of this program?

Mr. MURRAY. I would like to publicly state that I think private industry has done a magnificent job. I agree with Mr. Cole or with you that they have not put up the $250 million yet. But they have indicated that they will put up the $250 million, and we should not doubt for 1 minute that that $250 million will be put up. There is no ques-

tion about that. As I say again, I get back to my original thought, it is a question of how soon do you want the job done.

Representative PRICE. That is the big point.

Senator PASTORE. How do you side that up with what Dr. Libby has said, that there are just so many technicians and scientists and whether they are working for Government or private industry, you just have so many minds and so many hands. Would you expect the situation to be different because the Government takes it over? What have you got to say on that, Mr. Murray?

Mr. MURRAY. I recognize as everyone on the Commission recognizes the shortage of manpower to get jobs done. I do believe once you made up your mind that you had to have this job done on a schedule with established goals that the manpower would be forthcoming. It is all right to theorize that there is not enough manpower to go around. There are not enough scientists, and so on. We need a great many more scientists. But you put this up to the American public and say to them and American industry that this job has to be done, and here is the goal you have to reach, American industry will do it with the funds being put up by the Government. There is no doubt about it.

Mr. STRAUSS. Mr. Chairman, might I add just one word for the record. Dr. Davis and General Fields tell me that the amount of money which they estimate currently is being expended, this year, by private industry in the power field will run somewhere between 20 and 25 million dollars. That is an earnest, it seems to me, of serious intent.

Representative COLE. You mean in the atomic power field?

Mr. STRAUSS. Yes, I am sorry.

Representative DURHAM. I think we are all aware of the effort we saw in Britain and the keen interest they have in the development of power. Suppose Britain comes out with a reactor which they could sell to the world. It doesn't make any difference whether it is produced at 25 mills or 50 mills, we still are in the position of not having adopted any type of reactors that can produce power to a large extent, and in the eyes of the world, where are we going to sit in this picture?

Mr. STRAUSS. But we have such reactors, Mr. Durham. We have the reactor which the Belgians are buying. They could buy a larger one if they wished. While it is perfectly true that one may conjecture that someone will invent something better than we have, I don't know how one can protect one's self against that kind of contingency.

Representative DURHAM. No, but there is the fact that we have been considered the leaders in this field for a long time so that we all kind of feel a little bit jealous about that and worry about it.

Mr. STRAUSS. None of the figures which we have mentioned include the quite large sums which we are spending at Arco, at Argonne, at Los Alamos and at Oak Ridge in the development of reactors primarily designed either for military purposes or for pure primary reactor design. Those are the activities which I hope and I confidently believe will keep us well ahead of the rest of the world.

Representative DURHAM. Heretofore we just went out; when we decided to build a district, such as Savannah River, we built it rather quickly. In 2 or 3 years we had those producing. In other words, we really made fast progress. Now we seem to be kind of a little hesitant because it does something a little different.

Mr. STRAUSS. There is no hesitation on the part of this Commission at all, Mr. Durham.

Mr. DURHAM. I don't think so. I am not accusing the Commission. I know the problems connected with it over the years. I know it is very technical and a highly complicated job.

Senator PASTORE. I think that disposes of panel recommendation 2. Now I hand the meeting over to Mr. Durham.

Representative DURHAM. You just proceed to carry on.

Senator PASTORE. You were in the process of presenting Panel Recommendation No. 3, Mr. Vance.

Mr. VANCE. Gentlemen, we now have panel recommendation 3:

That the urgency associated with this program requires that the technological resource of atomic power be fully explored with high priority.

We concur that the development of atomic power is a matter of urgency and have assigned the civilian reactor development program high priority. The Commission's program is based on development of nuclear technology on a wide front as evidenced by the fact that 11 experimental civilian power reactors are being built or planned, utilizing 8 different reactor concepts.

Representative COLE. Before you leave that, why didn't you tell me a long time ago that the Commission has under consideration projects that would explore all of the eight projects. The best you could tell me was that you had five on the panel. Now you have projects for all eight of them.

Mr. STRAUSS. I think he said 5 and then 3, Mr. Cole. I am sorry.

Representative COLE. Are these the eight projects of a major type which you think the panel might have had in mind when they said we should develop all major types.

Mr. DAVIS. Mr. Cole, these 11 we are referring to here now are reactor experiments under our reactor technology program. These are not full-scale prototypes or demonstration reactors that we were referring to before. These are still the same eight types, however.

Representative PRICE. Only five are being developed; is that right? The others are experimental in the research program?

Mr. DAVIS. There are only five being carried to the full-scale stage. The other 3 are still in the development stage along with the other 5 as well.

Representative COLE. They are all experimental; are they not?

Mr. DAVIS. Yes, sir.

Representative COLE. Surely they are. It is stated that 11 experimental civilian power reactors are being built or planned utilizing eight different reactor concepts. What I am trying to find out is to what extent the Commission is meeting the criticism expressed by the panel when the panel says that the Commission with public funds if private funds are not forthcoming should get along in developing all major types of reactors. Does that statement of Mr. Vance mean that the Commission has under way reactors that are being built or planned, totaling 11 in all, utilizing the 8 different major type reactors.

Mr. FIELDS. That is right.

Mr. STRAUSS. I am prepared to give you their names and describe them if you care to.

Representative COLE. I don't want the detail.

Senator PASTORE. Any further questions on that recommendation?

If not, Mr. Vance, you may proceed.

Mr. VANCE. The panel's fourth recommendation is—

That atomic power be exploited as a source of electric power at a rate consistent with sound technological, economic, and public policy considerations.

The Commission concurs.

Representative COLE. That was a unanimous decision on the part of the Commission, I am sure.

Mr. STRAUSS. Yes. The next section entitled "Controlled Thermonuclear Power and Direct Conversion of Radiation Energy" is assigned to me. It is brief. It is a matter on which I would hope we would have an opportunity to testify to some greater extent in executive session.

The panel recommendation No. 1 reads:

That the Commission, within the limitations which national security considerations impose, permit the maximum interplay of scientific and engineering ideas, and develop procedures by which more people can contribute to the controlled thermonuclear program in the United States.

The Commission concurs with the above recommendation and feels that the recent action to make information on controlled thermonuclear reactions available to holders of access permits who have been granted access to this category of secret data is an important step in this direction. Other steps are being taken to draw additional talent into the field.

Under contract with the Commission, the University of Michigan, Massachusetts Institute of Technology, and the Naval Research Laboratory, have been studying the general program and it is anticipated they will shortly be undertaking active experimental work. Research and development contracts for specific projects have been arranged with other universities and industrial companies.

The Commission is now considering whether to downgrade or declassify more of the information on thermonuclear reactions. The question is one of weighing the relative advantages of the more rapid progress which might be brought about by more downgrading and declassification of information against the potential military value of the information to other nations.

Representative PRICE. Mr. Chairman, may I ask 1 or 2 questions?

Senator PASTORE. Yes.

Representative PRICE. How many requests for information have you had under the policy to make information on thermonuclear reactors available to those with access permits?

Mr. STRAUSS. Mr. Price, who is in charge of that division, can supply that number.

Mr. PRICE. We have received 21 applications for access to this category of information.

Representative PRICE. In the same paragraph you say:

Other steps are being taken to draw additional talent into the controlled thermonuclear field.

Could you tell us what some of those steps have been?

Mr. STRAUSS. That will be answered by Dr. Tom Johnson, the Director of Research for the Commission.

Dr. JOHNSON. Mr. Price, we have brought in industrial companies for supplying needed equipment, even when that equipment had not yet been developed. In other words, development contracts for new

equipment needed in the Commission's own research program. We have also brought in scientific talent from industrial companies to work in the Commission's own program.

Representative PRICE. You also state that more experimental work will shortly begin on the thermonuclear.

Dr. JOHNSON. I am sorry, I didn't understand your question.

Representative PRICE. In the second paragraph of the Commission's comment on recommendation No. 1, you say:

> Under contract with the Commission the University of Michigan, Massachusetts Institute of Technology and the Naval Research Laboratory have been studying the general program and it is anticipated that they will shortly be undertaking active experimental work.

How close are they to doing that?

Dr. JOHNSON. How close are they to active experimental work?

Representative PRICE. Yes.

Dr. JOHNSON. They have not yet given specific proposals as to what experimental activities they feel competent to undertake. But they are studying the program and looking at what the other projects are doing to see what part they might rightfully have in that.

Representative PRICE. I understand in a letter to the Chairman of the Joint Committee a short time ago the Commission stated that it was the Commission's opinion that information relating to controlled thermonuclear reactions is data concerning the production of special nuclear materials and falls within the definition of restricted data as defined in section 11 (r) of the Atomic Energy Act of 1954. Is that correct?

Mr. STRAUSS. That refers, Mr. Price, to a letter which I addressed to the Chairman of the Joint Committee. I have it in this volume, but I don't know the page number.

Representative PRICE. It is October 12, 1955.

Mr. STRAUSS. Yes. That is a correct statement to the best of my knowledge and belief, that it does involve restricted data, because it does bear on the production of special nuclear material.

Representative PRICE. Are you working on any downgrading or declassification of any material that pertains to this project?

Mr. STRAUSS. Yes. As this statement noted, we are now considering whether to downgrade or declassify more of the information. Dr. Johnson can tell you, if you are interested, of other places in which active work is going on. You seem to be interested in the fact that actual programatic work is not yet being undertaken by the University of Michigan, MIT, and the Naval Research Laboratory, but, as I believe you know, work is actively underway in five other locations.

Representative PRICE. I wonder if Dr. Johnson could tell us within the bounds of reasonable security just what is going on in this controlled thermonuclear field?

Dr. JOHNSON. I can tell you where projects are going on. We have large projects at Livermore, Calif., Los Alamos, N. Mex., Princeton, N. J.; somewhat smaller projects at the Oak Ridge National Laboratory and New York University.

Representative PRICE. I think that is sufficient.

Representative COLE. Mr. Chairman, I am curious to know if there is any dispute with respect to whether data relating to thermo-

nuclear development is restricted data? This is prompted by Mr. Price's inquiry.

Mr. STRAUSS. I am not aware of a dispute.

Representative COLE. I am very much surprised if there is any uncertainty in the minds of anybody. It is the Commission's exclusive opinion that data relating to thermonuclear development is restricted data because that very definitely was intended to be expressly stated in the law.

Mr. STRAUSS. That was our understanding.

Representative COLE. If there is any doubt about it, maybe we better do something about changing it.

Representative PRICE. Of course, we have had some doubts about some of the classification in the program. It is not a great controversial issue, but it is a project that we have been greatly interested in, and there have been public stories to the effect that perhaps some declassification might speed up this controlled thermonuclear program. I don't believe there has been any fighting about it. There has been public discussion to see if there could not be a step-up in some of the field of declassification to assist in speeding up the day when we might have a few answers to this program. I don't think there has been any fighting about it.

Mr. STRAUSS. Mr. Price, we are frequently exhorted to exceed our legal responsibilities and guidelines, but thus far the Commission in the 9 years in which it has operated has tended to strictly observe them.

Representative PRICE. I understand that. I think we understand the responsibility of the Commission. We also know that some time you have to keep digging into the program to find means or measures of expediting them and making them faster.

Representative DURHAM. The applicants have been very small in this field so far for more information. Isn't that correct? You only had 21?

Mr. PRICE. Mr. Durham, this category of information was only added to the access program effective February 4; most of these 21 applications have come in within the last 10 days or 2 weeks.

Representative DURHAM. You have declassified some material that has a direct bearing on thermonuclear, isn't that correct?

Mr. STRAUSS. That is correct.

Representative COLE. To what extent do you find the potential thermonuclear power has caused hesitancy in the conventional atomic power?

Mr. STRAUSS. I can't evaluate it, Mr. Cole. I think had there been no statement from the Commission to the effect that this was a very long-range project, there might have been some apprehension.

Representative COLE. That leads me into the other question I was going to ask you. I read this morning a very interesting interview by the chairman of the Joint Committee published in the current issue of a reputable magazine, Nation's Business, in which he estimated that the thermonuclear power program was perhaps around a 50-year corner; in other words, 50 years off. I am going to ask General Fields, because I don't want to get you in any more arguments with the chairman of this committee.

The Commission has stated that the thermonuclear power possibility is a very long-range program. How many years does the Commission

consider very long to be? Is it 50 years within the order of reasonableness?

Mr. FIELDS. I believe the Commission in previous statements has said that it is somewhere between several years and a hundred years. It is probably more in the nature of tens of years, at least.

Representative COLE. At any rate it is not foreseeable.

Mr. FIELDS. At the moment; no.

Representative COLE. At a stage so early that those who are now considering fission atomic power development should be seriously concerned?

Mr. FIELDS. That is correct, sir.

Representative COLE. And the Commission has found no evidence that the possibility of thermonuclear power has caused serious concern among the applicants?

Mr. FIELDS. I don't know of any serious concern. There is concern. There are industries, those engaged in the larger projects in the reactor development program, who have showed interest as to what the possibilities are.

Representative COLE. Do you know anybody who has been considering conventional atomic power who said I am going to wait on thermo power?

Mr. FIELDS. I do not.

Representative COLE. Because that is the thing?

Representative DURHAM. Your answer on that bothers me a little bit, General Fields. The fact that we have a known energy and don't take seriously trying to use it. You don't mean to say we are not taking it seriously at the present time?

Mr. FIELDS. I did not intend to say that.

Representative DURHAM. Any time we have had energy we have ever released we have taken it seriously and eventually developed it.

Mr. FIELD. We have development programs on this.

Representative DURHAM. We are taking it seriously?

Mr. FIELDS. Yes, sir.

Mr. STRAUSS. You have only to look at our appropriations for this purpose. They have increased very markedly each year since 1953.

Representative DURHAM. I know you are taking it seriously. I didn't want the impression to go out that we were not taking it seriously.

Mr. STRAUSS. Thank you.

Senator PASTORE. As a matter of fact, at Geneva you could not get anybody to ask a question on thermonuclear power after Dr. Bhabha talked on the subject.

Representative COLE. My attention has been directed to the Commission's statement to the panel on controlled thermonuclear in which the Commission says:

> It is virtually certain that no full-scale reactor will be developed in the next year or two.

Mr. STRAUSS. I think we will all underwrite that.

Representative COLE. Let me parenthetically say that required a lot of consideration, too.

Mr. STRAUSS. It was unanimous.

Representative COLE (reading):

> It is, however, highly probable that success will be achieved eventually.

That is the same as saying that it is the difference between a few years and a hundred years. When the Commission says it is not going to be in the next year or so, does not indicate it is far in the future.

Which is the correct thinking of the Commission with respect to controlled thermal? Is it a long way off or might it come soon? I think the folks who will run the risk in putting up the money for conventional atomic power ought to know the best judgment you members of the Commission may have on the possibility that their investment may be wiped out by the discovery of the harnessing of controlled thermo.

Mr. Strauss, what is your opinion as official spokesman for the Commission?

Mr. STRAUSS. I would first say that is a model of a conservative statement in that document.

Representative COLE. You mean the guaranty that it won't be 1 or 2 years?

Mr. STRAUSS. Yes. But there is this to be said, Mr. Cole. An estimate of when something is going to be invented is, of course, impossible. In this particular situation a number of inventions are required—a considerable number. Even were they all made or in hand within the next 2 or 3 years, we know from experience—the experience that has been derived from the building of atomic piles and power reactors, that years are required after the basic knowledge is attained before practical results are to be had. Therefore, I think it is safe to say that those plants utilizing fission for atomic energy will be amortized before they have to compete with plants using fusion as a basis of the production of energy.

Representative COLE. Thank you very much.

Mr. STRAUSS. That is an expression of an individual opinion and is not a commitment of my colleagues.

Senator PASTORE. Any further questions?

Representative COLE. Is there any disagreement with that statement on the part of the members of the Commission?

Mr. MURRAY. No.

Dr. LIBBY. No.

Mr. VANCE. No.

Senator PASTORE. Mr. Strauss, you may continue.

Mr. STRAUSS. The next panel recommendation bears, as a matter of fact, on one of the questions recently asked. Panel recommendation No. 2:

"That the Commission, in encouraging investment in nuclear fission power, see to it that investors have sufficient information about the feasibility of nuclear fusion power upon which to base determinations for themselves as to the propriety of their investments and actions.

The Commission has recognized the usefulness of information on nuclear fusion power to those considering investing in atomic power.

Under the access permit program, a sufficient demonstration of need for this information in connection with investment in fission power would afford a basis for granting access to classified information in the area of nuclear fusion power.

The Commission, I am sure, is going to exercise this strictly so that mere curiosity seekers will not have access permits, but that those with a real need to know will get it.

Representative COLE. Have you rejected any applications so far?

Mr. STRAUSS. These have been received so recently, within the last 10 days, Mr. Cole, that I do not believe all have been acted upon.

Mr. PRICE. Mr. Cole, only one has been acted on. It was granted. There are 20 pending. They almost all came in within the last 10 days.

Representative COLE. I thought you said you granted 21.

Mr. PRICE. No, 21 applications which are very recent.

Mr. STRAUSS. Mr. Chairman, if there are no further questions on this subject——

Representative PRICE. I have just one observation. When I was speaking about declassification, I had reference to your own statement at the top of page 6.

Mr. STRAUSS. I didn't mean to imply that it was originated by you. I apologize if you think I did. I did not have that in mind. That was furthest from my thought.

Senator PASTORE. Now that we have that straightened out, will you take up the next subject?

Mr. STRAUSS. The next subject, Mr. Chairman, is medicine and public health, and with your permission Commissioner Libby will present it.

Senator PASTORE. The only suggestion I was going to make is the idea of the acting chairman, after consulting with at least Congressmen, if the others want to stay longer, we will stay longer, but we thought we would finish about 4 o'clock. If we can't finish that subject at 4 o'clock, I think it would be better to stop at this point.

Representative COLE. Mr. Chairman, it seems to me that this subject is of such live and general interest that we certainly cannot complete it in 10 minutes' time and we better go over to another period.

Senator PASTORE. I agree with that thought. Then we will recess at this point.

(Thereupon at 3:50 p. m., Wednesday, February 29, 1956, a recess was taken until Thursday, March 1, 1956, at 10 a. m.)

DEVELOPMENT, GROWTH, AND STATE OF THE ATOMIC ENERGY INDUSTRY

THURSDAY, MARCH 1, 1956

CONGRESS OF THE UNITED STATES,
JOINT COMMITTEE ON ATOMIC ENERGY,
Washington, D. C.

The Joint Committee met at 10 a. m., pursuant to adjournment, in the Old Supreme Court Chamber of the Capitol, Senator Clinton P. Anderson (chairman of the Joint Committee) presiding.

Present: Senators Anderson (presiding), Pastore, Gore and Jackson; and Representatives Durham, Price, Cole, and Van Zandt.

Chairman ANDERSON. The committee will be in order.

Mr. Strauss, I am sorry that I was not able to return yesterday afternoon. We spent a somewhat futile afternoon in our endeavors but I was unable to return to the hearing here.

Representative COLE. I do not know whether it has been reported to you or not, but I can assure you that the members of the committee left behind did not spend a futile afternoon. We uncovered the fact that there is something like $300 million worth of pending applications to invest in various types of atomic reactors.

Chairman ANDERSON. I was glad to hear it.

STATEMENTS OF LEWIS L. STRAUSS, CHAIRMAN; DR. W. F. LIBBY, MEMBER; THOMAS E. MURRAY, MEMBER; AND HAROLD S. VANCE, MEMBER, ATOMIC ENERGY COMMISSION; K. E. FIELDS, GENERAL MANAGER; WILLIAM MITCHELL, GENERAL COUNSEL; W. K. DAVIS, DIRECTOR, OF THE DIVISION OF REACTOR DEVELOPMENT; HAROLD PRICE, DIRECTOR OF THE DIVISION OF CIVILIAN APPLICATION; DR CHARLES L. DUNHAM, DIRECTOR OF THE DIVISION OF BIOLOGY AND MEDICINE; AND C. L. MARSHALL, DIRECTOR OF THE DIVISION OF CLASSIFICATION, OF THE UNITED STATES ATOMIC ENERGY COMMISSION

Mr. STRAUSS. Yesterday afternoon we had reached section III, Medicine and Public Health, which is to be presented with your permission by Commissioner Libby. Before doing so I would like to note for the record an item which I anticipated in the course of questions and answers yesterday, as follows:

The General Electric Co. and the Pacific Gas & Electric Co. notified us of their decision to build and operate an atomic powerplant to serve the San Francisco Bay area. The plant which will be located in the Livermore-Pleasanton area of Alameda County, Calif., will

be financed entirely by private capital. The plans call for completion of the plant during 1957 at a cost between 3 and 4 million dollars. Initially, the plant will have a generating capacity of 5,000 electrical kilowatts and an ultimate capacity of 10,000 electrical kilowatts or more.

The plant is the fourth reactor proposed by industry under the straight license provisions of the law whereby such plants are financed entirely by private funds without request for direct Government financial aid.

This is a plant which, we understand, while a practical plant which will be selling power, is an experimental facility in the sense that it will precede and be of assistance to the General Electric Co. in the work which they are doing for the Edison Co., the larger construction that will take place for completion in 1960, concerning which testimony has already been introduced.

Chairman ANDERSON. What is the capacity of it?

Mr. STRAUSS. 5,000 to start with, and 15,000 or more when it is completed.

Chairman ANDERSON. We would not regard that as significant from the standpoint of power, would we, because we did not regard the Russian station of 5,000 as important?

Mr. STRAUSS. This is only significant, I would say, from the point of view of the testimony by reason of the fact that no Government money is involved, and that it is an earnest intention of these companies to continue work on the larger projects for which projects such as this and the one at Lynchburg, which was mentioned yesterday, are anticipatory.

Representative COLE. Was this reactor to be used by Livermore Laboratory?

Mr. STRAUSS. To the extent it would be in the grid from which Livermore derives its power, I would imagine so. But I do not know that as a positive fact.

Representative COLE. If a contract had been made by Livermore with the Pacific Gas & Electric for this energy, would the Commission necessarily know about it, or have any supervision of such a contract?

Mr. STRAUSS. I would doubt it, Mr. Cole, by reason of the fact that Livermore is operated, as you know, by a contractor, the University of California, and I do not believe that the Commission necessarily would know from whom the contractor purchased energy.

Representative COLE. If the contractor were to purchase energy at an abnormal rate, the Commission would necessarily have to know about that.

Mr. STRAUSS. We would know that instantly.

Representative COLE. Since the Commission does not know anything about it, it must be assumed that the rate which Pacific Gas expects to receive for the energy produced at this reactor is not out of line with the normal rate.

Mr. STRAUSS. I would feel confident in giving you that assurance, and I would also like to mention at this point that our auditing procedures are sufficiently good so that the General Accounting Office, a few days ago, sent us what I could only regard—what we could only regard—as an accolade for our accounting procedures at Savannah

River, which, of course, are very much larger—operating a very much larger and more expensive installation than the one at Livermore.

The General Accounting Office stated that they were able to reduce the volume and expense of their audit at Savannah River because of what they had found and experienced in connection with our own. I would like to send that letter from the General Accounting Office to the committee. I believe that you will be pleased with it. We were.

Dr. LIBBY. On the matter of medicine and public health, the panel's first recommendation was:

That it is necessary to provide all medical schools with adequate facilities for training in atomic medicine techniques.

Our comment on this is that it would be desirable to provide facilities for training in atomic medicine techniques in the medical schools of the United States. It would be necessary, of course, to make certain basic changes in curricula to accommodate courses of instruction in radiation treatment and therapy, especially in the use and handling of radioisotopes. The Commission, through its research program in biology and medicine, has made available research equipment and facilities as well as operating funds to a number of hospitals and medical schools throughout the United States.

It should be noted, however, that with few exceptions, the Commission's role has been limited to providing facilities and equipment in connection with research proposed by the institution itself. We believe this is an appropriate and proper role for the AEC. If facilities as such are to be provided medical schools strictly as a means of stimulating interest and enabling instruction in atomic medicine techniques, this would seem to be especially appropriate for consideration by the Department of Health, Education, and Welfare, and the States as well as nongovernmental bodies and foundations. The AEC would, of course, cooperate fully in identifying the types of facilities and equipment which would be most useful and in providing assistance and in organizing courses of instruction to supplement current medical school curricula.

In other words, we do agree that these facilities should be made available but we are a little loath to take it on ourselves, thinking it belongs better elsewhere. First, we should be invited by the schools and the Department of Health, Education, and Welfare, and other groups who should be involved in it.

Representative COLE. Dr. Libby, did you and the Commission interpret the panel's recommendation that these reactor atomic facilities for colleges should be provided by the Federal Government? It was my recollection, from reading the panel's recommendations, that these educational institutions should get out and provide them, or provide themselves with the funds to provide the facilities.

Dr. LIBBY. I am afraid I, personally, had the first interpretation, Mr. Cole.

Representative COLE. No doubt you are right, but my recollection was different. Your statement is predicated upon the interpretation that it was the panel's interpretation to recommend that faciliies would be provided by the Federal Government.

Dr. LIBBY. I would like to ask Dr. Dunham if this also is his understanding of the recommendation of the panel.

Dr. DUNHAM. It is my understanding, from reading a number of these panel recommendations with reference to health and medicine, that the panel itself left the question fairly wide open, in urging that the Government get into it, and private philanthropic organizations as well to do it.

Representative COLE. I can read what the panel said. You could not have interpreted the panel's interpretation as the intention of the panel that these facilities should be provided by the Federal Government. The panel says:

> In setting forth the recommendations below, we have purposely refrained from suggesting specific methods of financing. It is our strong feeling, however, that medical institutions and research centers should not assume a passive role and expect the Government, and more especially the Commission, to assume all or even a major portion of the responsibility for providing research facilities, equipment, and material.

So my recollection on the panel report was not incorrect.

Dr. LIBBY. This makes us practically agree completely, I would say.

Representative COLE. It makes you what?

Dr. LIBBY. Agree completely with the panel's recommendation, if that be it. Our position is that we should help in collaborating and assisting and advising and doing everything we can. But the matter of setting up the curricula in the medical schools is not primarily the Atomic Energy Commission's business.

Representative COLE. And if the Federal Government is to assist in the financing of the facilities, that financing would not come from the Commission but rather from the Department of Health, Education and Welfare.

Dr. LIBBY. That is right.

The panel's second recommendation on this subject was that—

> It is necessary to create additional research centers with all appropriate equipment, including reactors.

Our comment is that additional research centers at or near medical schools undoubtedly would tend to attract additional qualified persons to those centers. There is, however, a close interdependence between faculties and facilities, as the report points out on page 59, paragraph 2. This is particularly true of atomic energy research facilities of the type described in the recommendation. The absence of a minimum number of trained personnel probably would make such center unproductive and uneconomical. Proper balance is needed and this requires careful study of the particular requirements of each medical school and teaching hospital or of groups of schools and hospitals in the same general locale.

No clear plan now exists for implementing this recommendation. The combined efforts of Government, industry, and private philanthropic organizations are required. The organizing of these groups for such a large and important undertaking is a prime requirement. But the key to additional research centers, properly equipped, is in the hands of the medical institutions which must supply the initiative.

I think you see in our comment on this a similar attitude to the problem, similar to the one in recommendation No. 1.

Representative COLE. Is there any evidence that medical schools in the country are sufficiently interested in establishing research centers to the end that there is an appearance they are providing the initiative to do this?

Dr. LIBBY. USLA is interested, and there is a large reactor going to be built there for this purpose. It is the only one so far.

Dr. DUNHAM. It is the only one that goes to the extent of reactors, but there are many that are setting up rather extensive radiation laboratories, using high-energy machines. That is, for radiation studies as well as isotope work.

Representative COLE. Of course, if the Commission assumes the initiative in creating the research centers, and after they are created they have a lack of interest or a neutral interest with respect to the use of them, outside of the UCLA situation, I judge then that there is no apparent evidence of the type of initiative on the part of educational institutions in a particular section or geographical area to unite toward creating a research center for that section or area.

Dr. LIBBY. With the qualifications Dr. Dunham mentioned, I would agree, yes.

The third panel recommendation was that—

It is necessary to design low-cost atomic medical equipment suitable to the needs of the 6,100 hospitals and medical clinics without atomic facilities and provide at least minimal facilities to this group as rapidly as possible.

Our comment is that the Commission in the past has fostered and is continuing to foster the design of relatively low-cost medical equipment for handling and use of radioisotopes. The Commission also has sponsored research at Commission laboratories and elsewhere looking to the design of instruments, such as surgical probes, for use in medical research and therapy. The provision of minimal facilities to all hospitals and clinics would seem to be appropriate for consideraton by the same groups mentoned in our comment on panel recommendation 1, that is, the Department of Health, Education, and Welfare, and the States, and other groups.

The panel's fourth recommendation was that—

It is necessary to make available at reasonable prices the now-expensive radioactively labeled organic compounds essential for research and therapy.

Our comment is that we agree that the prices of many radioactively labeled compounds are at present very high and that effort should be made to make these valuable research and therapeutic substances available at much lower prices in order to encourage widespread use. The labeling of compounds has been placed in the hands of private industry to promote normal competition with the expectation that this would reduce prices. A direct subsidy of the various private companies now labeling compounds would have many disadvantages not the least of which might be that of reducing the incentive for more efficient and less expensive methods. The idea of a "bank"—page 60 of the report—"jointly financed by users and suppliers alike, with Government assistance, if necessary," has real merit.

Representative COLE. From what standpoint?

Dr. LIBBY. The problem can be put rather simply. The synthesis of a drug with radioactive materials is extradifficult because of the radioactivity, and if it is made in small amounts the cost per unit amount is very large. I have the notion that this is in large part the basis of the high costs of these radioactive drugs, and if we could have the companies combine together in some way so that instead of making a few batches, or a small amount, a large amount would be made which would be made available to the whole group, I think the costs will go

down. So I think the panel had a very good idea, and I think it will help.

Representative COLE. That is quantity production, you mean?

Dr. LIBBY. Yes, quantity production.

Representative COLE. Are these isotopes, for the most part, of the type that can suffer standing on a shelf for indefinite periods?

Dr. LIBBY. Some of them.

Representative COLE. I say, for the most part.

Dr. LIBBY. For the most part, they stand up very well. The most important of them has a lifetime of 5,000 years. So there is no loss appreciable there. The next most important one is 12 years. That is pretty stable. But then you rapidly get into things like radioactive sulfur, which is 3 months, and now deterioration is a consideration. So they range, and some of them do suffer. These would be less adaptable to the "bank" type of approach.

Representative COLE. It would be a question of selecting the ones that would last longer.

Dr. LIBBY. That is right.

The panel's fifth recommendation was that it is——

Representative COLE. Before leaving that suggestion of the panel which the Commission now says has merit, what does the Commission propose to do about it? Have you considered the suggestion far enough along to reach a conclusion?

Dr. LIBBY. I will have to refer this to the General Manager or Dr. Dunham.

Dr. DUNHAM. I think there has been a pattern set. The National Institute of Arthritis Metabolic Diseases of the Public Health Service felt there was a need for labeled cortisone, the "wonder drug" for arthritis, and many researchers were interested in it. They actually put up, I think, sixty or seventy thousand dollars, and we gave them the carbon-14, which was only $6,000, and they had a batch of this material made. The committee was formed to parcel it out among competent researchers both in this country and abroad. I think this sore of thing is probably the most natural and best way to deal with these very expensive labeled compounds.

Representative COLE. Who supplied the initiative in that instance? Was it the Institute or the Commission?

Dr. DUNHAM. I think it was the scientists. It was the scientists that developed the need, and I think, one of the study sections of the National Institutes of Health, and then it was a matter of getting together the two agencies and working out a method for making the material available.

Representative COLE. The scientists used the Institute of Health as the medium for doing it?

Dr. DUNHAM. That is right.

Representative COLE. That was not the name. I think you gave another name.

Mr. DUNHAM. It was the National Institute of Arthritis and Metabolic Diseases where this originated, but it was within the National Institute of Health's framework.

Chairman ANDERSON. We had some testimony, Dr. Libby, somewhere, I guess in the research group, about the fact that no standards had been set up for the safe handling of some of these things which

the Public Health Service would ordinarily set up. Is that causing any trouble as yet?

Dr. LIBBY. I think that we have standards, haven't we, Dr. Dunham?

Dr. DUNHAM. I am not quite sure what the chairman is referring to.

Chairman ANDERSON. The Commission has set some up, but doesn't the Pure Food and Drug Act require another agency to set some up?

Dr. DUNHAM. That is for drugs that get into interstate commerce, but not for this type of experimental use. Most of the work, actually, with this particular type of thing I was mentioning, has been done in animals and not in humans. We have our own standards and recommendations as to how much can be used in what kind of a patient.

Dr. LIBBY. It is possible, is it not, Dr. Dunham, for a doctor properly accredited to use radioactive carbon in a patient he is treating?

Dr. DUNHAM. That is right.

Dr. LIBBY. The regulations have been set up for that.

Dr. DUNHAM. When it becomes a new drug in the Food and Drug sense of the word, then they also are involved in the thing.

Representative COLE. None of the isotopes have reached that point.

Dr. DUNHAM. Radioiodine, for certain purposes, has just about reached that point, in fact, I think it has now; that is, iodinate human serum albumin for certain metabolic studies, and radioiodine for diagnoses and treatment of certain thyroid conditions. In fact, it is about to be put into the Pharmacopoeia—that is the National Pharmacopoeia; and this will be the first radioisotope that will have appeared in that volume.

Representative COLE. Who makes the determination of whether an isotope has been experimented now to the point of proof, and then it becomes classified as a drug under the terms of the pure food and drug law?

Dr. DUNHAM. I think it is largely the Food and Drug Administration, but I am not sure what the relationship of this committee that developes that National Pharmacopoeia and reedits it every 5 years has to the Food and Drug Administration, but it is between those two groups.

Representative COLE. The Commission has no voice in it?

Dr. DUNHAM. I am sure we would be consulted, as we have been on this particular point.

Representative COLE. But you do not have any control over it, or decision, or responsibility?

Dr. DUNHAM. No.

Dr. LIBBY. Of course, Mr. Cole, as you know, we have on the issuance of isotopes—we are very careful that the people using them are qualified to do so.

Chairman ANDERSON. Dr. Libby, I can get a statement for you on this, as to why the question was raised, but in the research hearing, the Food and Drug people were before us and we asked them if they had gone far enough so that they could set up standards for the labeling of these therapeutic drugs, and they said, "Frankly, we cannot do it, we are not that far along yet," and I wondered if there was a field where they needed cooperation with the Atomic Energy Commission.

Dr. LIBBY. We would be pleased to furnish our comments on those things.

Mr. DUNHAM. We meet with them fairly frequently, and we actually had an ad hoc committee that went along for several years, a preliminary committee, and now it is on a more direct basis rather than through a committee.

Chairman ANDERSON. The fact that these are not moving in interstate commerce yet does not mean that they will not be moving shortly in interstate commerce.

Dr. DUNHAM. It is coming very fast.

Representative COLE. These are moving in interstate commerce, I am sure.

Dr. DUNHAM. Not as drugs in the sense that you buy them over the counter.

Representative COLE. They are still in the experimental stage, but actually they do cross State lines.

Dr. DUNHAM. By all means; yes.

Representative COLE. To that extent they are in interstate commerce, but they are still experimental.

Dr. DUNHAM. Yes.

Wr. LIBBY. The fifth recommendation was that—

It is necessary to assure prompt availability of current atomic developments in the field of medicine and medical research, with opportunity for full interchange of latest data and without interference of the independence of medical research investigators.

Our comment on this is that the medical profession relies mainly upon the journals of its general and specialized societies for current data and findings. The Commission has always encouraged investigators working on Commission-financed projects to report in the journals of the societies as much as possible of their results. The Commission has further called attention in its semimonthly abstract publication, Nuclear Science Abstracts, to all the journal literature having a bearing on usages of atomic energy in medicine. It is continuing this reference service. Classification limits access to Commission-financed medical research only in the field of reporting biomedical research conducted at weapons tests. Efforts are currently underway to publish as much of these reports as is possible within the limits of security.

The panel's sixth recommendation was that—

It is necessary to inaugurate a nationwide educational program on the more judicious use of radiation and the need for better recordkeeping of the exposure of individuals to radiation from all sources.

Now, our comment on this is that the statement "more judicious use of radiation" apparently refers to such radioactive sources as X-ray and fluoroscopy used outside of the atomic energy program. An educational program in regard to the use of such equipment is, therefore, a matter to which the Department of Health, Education, and Welfare, the States, and others may wish to respond.

The AEC keeps very complete permanent records on the exposure of personnel to radiation in connection with the atomic energy program. The proposed Commission regulation on radiation protection, as now drafted, will require that licensees maintain records of radiation exposures from licensed material. The provision and maintenance of exposure records of non-AEC exposure as from diagnostic and therapeutic X-rays would impose a nearly impossible burden on the Atomic Energy Commission. Since this recommendation con-

cerns a public-health problem, the Department of Health, Education, and Welfare may wish to comment on it.

Mr. STRAUSS. Dr. Libby is also to present section 4, Mr. Chairman, on agriculture.

Chairman ANDERSON. I was thinking a moment or two about this last statement there. If AEC does not give up this information, certainly no one else will for the present; is that right?

Dr. LIBBY. I should think that Secretary Folsom's Department might. We would be pleased to help them in the job. It is, of course, a very difficult job, Senator Anderson, to keep track of these X-ray exposures.

Chairman ANDERSON. I think the committee recommendation is that it is necessary to inaugurate a nationwide educational program on the need for better recordkeeping of exposure of individuals to radiation from all sources.

Dr. LIBBY. I think we fully agreed to the need.

Chairman ANDERSON. I was talking about the panel recommendation.

Dr. LIBBY. I understood you to mean the panel. We certainly agree on the need for educational programs, and we have been trying to do just this and to keep educating people in groups on the effects of radiation insofar as we know them.

We know quite a lot about health damage, and less about genetics damage and long-range health damage, but we are learning and we are making it available in trying to do all we can to educate people in these respects.

But our comment was mainly on this matter of recordkeeping, which is a back-breaking job. We do it for our own people, but we think it probably is not our job, for the X-rays at least.

Chairman ANDERSON. Do you so read the panel recommendation?

Dr. LIBBY. Well, yes, I did.

Chairman ANDERSON. The panel recommendation, again, is that it is necessary to inaugurate a nationwide educational program on the need for better recordkeeping.

Dr. LIBBY. That is right.

Chairman ANDERSON. It would not necessarily involve the Commission. I would say that you would want to resist it if they were trying to throw this on you. But is it not important that the record be kept somewhere? And it has been pointed out that the proposed Commission regulations on radiation as now drafted will require that licensees maintain records of radiation exposures from licensed material. Now, will they have any material that is not licensed material?

Dr. LIBBY. No.

Chairman ANDERSON. Involved in this sort of work?

Dr. LIBBY. No.

Chairman ANDERSON. So you are going to require records to be kept?

Dr. LIBBY. I think the main thing outside of our purview is X-rays.

Dr. DUNHAM. Mr. Chairman, they might, as you know, have X-ray machines, industry using them to diagnose flaws in casings, and this would not fall under the jurisdiction of the AEC. On the other hand, the Department of Health, Education, and Welfare has a very active program right now of education.

Chairman ANDERSON. I say, they are using it on casings. Are they going to get radiation burns?

Dr. DUNHAM. The people who use it will get some exposures, even though they are not deliberately irradiating themselves.

Chairman ANDERSON. Is it desirable to keep a record of that exposure?

Dr. DUNHAM. I think it would be very useful, just as the radiologists are now keeping records of their own exposures, whereas they did not before World War II.

Chairman ANDERSON. What then is the objection to the recommendation?

Dr. DUNHAM. There is no objection, sir.

Chairman ANDERSON. I do see a reason to object if the thought is that they want the Atomic Energy Commission to keep this whole thing ourselves, but certainly, if you are going to license somebody else to use some equipment, they should not object if you require them to keep track of this sort of serious thing, because otherwise it will not be kept.

Dr. LIBBY. I think one wants these regulations to be reasonable, and too much redtape might kill the goose, so to speak. But it seems to me to be a very desirable thing, to keep some sort of records.

Chairman ANDERSON. If I recall, Dr. Libby, when I was trying to help a group set up a department of health in New Mexico, at the time I was connected with health work, we had a great deal of difficulty over whose responsibility it was to keep birth records and preserve them.

Now, after a long period of years, it is hard to go back and dig these things up again, and institute a proper system of it, whereas, if it is started early, and every time somebody gets a license for this they have to keep track of it some way, then you at least have an area where you can go back and pick up the records and study them when you want to or someone else wants to. I think that is all the panel report meant.

Dr. LIBBY. With that understanding, we agree with it.

Chairman ANDERSON. Will you proceed with it?

Dr. LIBBY. On the subject of agriculture, the panel's first recommendation was that—

The humanitarian benefits which can result from the application of atomic developments to agriculture require that this technological resource be fully explored with high priority.

Our comment is that the Commission fully realizes the humanitarian benefits to be derived from the application of atomic developments to agriculture. We believe our role in this area is to conduct some fundamental research and to cooperate in research programs of the agricultural agencies. In our recent testimony for the section 202 hearings before this committee, we detailed some of the work that has been done.

We certainly agree with this recommendation completely.

Their second recommendation is that—

Those charged with meeting the farm surplus problem take into consideration the fact that such atomic developments—as other major new farm techniques—will contribute materially to farm output.

The Commission agrees that atomic developments in agriculture will contribute materially to farm output.

The third panel recommendation is that—

The agencies and departments concerned with assistance to foreign countries develop a coordinated and vigorous program of high priority with technical assistance from the Commission, to focus atomic research where it can be useful soonest in undernourished countries. Only in this way can the United States bring to bear atomic contributions to agriculture, so as to demonstrate our historic sense of international humanitarian leadership.

The Commission concurs. We are already providing technical assistance on a high priority basis and we have plans for greatly expanding our activities in this area.

Representative COLE. What are you doing now, and what do you plan to do?

Dr. LIBBY. I would like to have the General Manager and Dr. Dunham speak on that.

Dr. DUNHAM. Right now we are considering a number of ways and means of offering—

Representative COLE. What are you now doing? You say that we are already providing technical assistance on a high priority basis, and I am curious to know what that consists of.

Dr. DUNHAM. It is largely, right now, offering training opportunities for scientists from countries all over the world to come to Brookhaven, and also through State and private institutions through ICA and other agencies, to get training.

Representative COLE. That is the International Cooperation Administration?

Dr. DUNHAM. Yes, to get training in using the various techniques which we have found useful. They are relatively simple techniques. There is a matter of using a gamma field to stimulate mutations, and then more rapidly to be able to select out favorable new varieties that may be rust resistant, and so forth. Most of those countries are pretty well experienced in plant breeding.

Representative COLE. Can you tell us how many countries have participated and taken advantage of the offer, and the number of students, or do you have a record of that?

Dr. DUNHAM. I do not have a record of that, but I will be glad to make it available.

Representative COLE. I think it would be of interest if you would supply it for the record.

Dr. DUNHAM. Yes, sir.

Representative COLE. Can you tell us the countries which have sent students?

Dr. LIBBY. We can supply that for the record, Mr. Cole.

Representative COLE. Has it been one or two or half a dozen or a dozen?

Dr. DUNHAM. My guess offhand would be somewhere between 20 and 30.

Representative COLE. Different countries?

Dr. DUNHAM. No; individuals.

Chairman ANDERSON. Can you mention a country?

Dr. DUNHAM. No; there has been at least one from the Philippines, but I would prefer to check back on the record and see which countries have been involved.

Representative COLE. Would you supply that for the record?

Dr. DUNHAM. Yes, sir.

(The information requested is as follows:)

Twelve agriculture students from Austria, Sweden, Brazil, England, India, and Pakistan have spent up to 4 weeks at Brookhaven National Laboratory. Five more students were sent to this country via the International Cooperation Administration for specialized training in the use of radioisotopes in agriculture from Spain, India, and Guatemala. In addition, one Philippine medical corps officer who was here for radioisotope training visited the Department of Agriculture Experiment Station at Beltsville.

Representative COLE. Now, tell us what you are thinking about. You say that you have plans for greatly expanding those activities.

Dr. DUNHAM. What we are thinking of right now is to continue this matter of training and introduce them to cobalt sources, and then plan to send task forces to the different countries. There is a group now of about 6 people in agriculture and medicine, largely from our own national laboratories and major contractors, who have agreed to go to South America sometime within the very next few months and spend 2 or 3 weeks in major agriculture and scientific centers, giving symposia and lectures and the like. At the same time we are considering providing these countries with a cobalt source so that they can have their own gamma fields.

Representative COLE. This is all being done at the request of these particular countries to which the visits will be made?

Dr. DUNHAM. That is correct.

Representative COLE. Did you say there would be 6 teams, or you have already had 6 individuals?

Dr. DUNHAM. I say there are six individuals lined up who will go just as soon as arrangements can be made.

Representative COLE. Will they go as individuals?

Dr. DUNHAM. They will go as a group.

Representative COLE. Six of them.

Dr. DUNHAM. Yes, and it is planned to have several such trips to different parts of the world. We have to watch about our own manpower problems and so we are not going to send the same people everywhere. We will have to parcel this out.

Chairman ANDERSON. You have done a fine job on work with oats, for example, where you can irradiate the oats and within a period of a single season get probably all of the mutations that might occur in 50 years. Have you taught that technique to the agriculture people in any other countries?

Dr. DUNHAM. This is what we are doing right now. None of the tropical plants have really been studied from this standpoint.

Chairman ANDERSON. In connection with the foliage feeding, I have seen some story about how quickly the fertilizer that may be sprayed on the underside of the leaf gets into the trunk, compared with the length of time it takes to put it at the base of the tree. That ought to be of great interest, it would seem, to those areas where they take the sap of a tree and they use it for a certain purpose. Take a rubber plantation, for example. Has it seemed to have any interest to those people, and have you had inquiries from them about it?

Dr. DUNHAM. Not directly in that sense. It has been mainly interest on the part of individual scientists from those countries saying, "Tell us more about these things," and it is not specifically with reference to a rubber plant, or a particular crop.

Chairman ANDERSON. Are the nurserymen of this country interested in the possibility of developing a way of spraying a tree so that it makes better utilization of fertilizer and seems to put some life in it? Has that appealed to them, and have you had inquiries from people who develop nursery stock?

Dr. DUNHAM. This I am not aware of.

Chairman ANDERSON. It seems to me it is of great importance.

Dr. DUNHAM. It is. As to whether or not this can be done effectively, it varies from tree to tree.

Representative COLE. I would like to make certain of that, and I judge it is not a standard conclusion that foliar fertilization is the better way of application with respect to all plants.

Dr. DUNHAM. In some cases it is of no use at all.

Representative COLE. It depends on a particular plant. Some use it more readily by foliar than others, is that right?

Dr. DUNHAM. That is right, and at certain stages in the development of the fruit it makes a difference. That is, a difference whether or not there is adequate uptake through the leaves.

Dr. LIBBY. There have been some very dramatic applications for certain metallic deficiencies in citrus crops. Zinc is necessary to oranges, I believe. They found by adding a tiny amount of zinc to the insecticide spray that they could feed the plant its necessary amount of zinc much more efficiently than if they put the zinc in the soil. This was a simple thing to do, and add the zinc to the spray which you used for other purposes. That is a type of application of foliar feeding where the effects are enormously greater in foliar than they are through the root system.

Representative COLE. You mean, by applying zinc to the under leaves of the tree we get bigger grapefruit, or prettier grapefruit, or what?

Dr. LIBBY. I have forgotten just the results.

Representative COLE. What are the results?

Dr. LIBBY. If an orange does not have zinc, something horrible happens to it.

Dr. DUNHAM. I do not know enough about orange culture at the present time to comment.

Chairman ANDERSON. The next question might be, Have you had an opportunity to work with this with universities in Florida or Texas, or Arizona and California, where these citrus crops are important? I am wondering how anxious they are to get ahold of it.

Dr. LIBBY. About the middle of January we had a conference in East Lansing, Mich., of groups interested in this type of thing, and we had between 100 and 200 people attend this meeting. It was one of the best scientific meetings I have attended in recent years. Everybody was very interested. They were from all over the country, not just the Midwest. There were people there from California, from the citrus groups. The citrus problem was brought up repeatedly. The principal contribution isotopes have had to this problem has been to clearly delineate the importance of foliar feeding as compared to root feeding. Before, you see, if you sprayed, you were not quite sure if you got a good crop whether it was the exigencies of the weather or other things, but now, on an experimental basis, you can put radioactive materials

only in the spray, and you see that go in, and there is no doubt about the answer. This has clarified it.

Dr. Tukey, of Michigan State College, has written me a letter recently saying that he hopes this type of foliar feeding and fertilization will make it possible to do dramatic things in the culture of plants in the subarctic. He is working very hard on this. He is very hopeful about the results.

Representative COLE. Culture of plants in the subarctic?

Dr. LIBBY. Yes.

Chairman ANDERSON. Where you have a short growing season, and you can stimulate the growth in Alaska, where they have had endless trouble?

Dr. LIBBY. That is the way I understand it; yes.

Chairman ANDERSON. I think this is a very, very important line of research, and I am glad it is being undertaken. Have you been doing any research particularly for foreign countries? Suppose we have a citrus fruit problem here, of how to get a substance into the citrus grove, and you find that by spraying with insecticides you accomplish it. Is there another country that has come to you and said, "Now, we have a problem in connection with a mango tree, or a particular variety," have they come to this country with that?

Dr. DUNHAM. This is just the beginning. We had a delegation from the Philippines last spring, and we have had them from other countries. They have come and visited our places and talked with the agricultural scientists both of the Commission and the Department of Agriculture, and State experiment stations.

Chairman ANDERSON. So far as we know, there is an interest?

Dr. DUNHAM. Yes, sir.

Chairman ANDERSON. There are probably no other countries doing work in this field than the United States.

Dr. LIBBY. Russia reported on some good work at Geneva, some very good work.

Chairman ANDERSON. Other than Russian, however; is that all?

Dr. LIBBY. Great Britain, too, and Canada, also. So it is fairly extensive. It is widespread. I think that there is no doubt that the use of isotopes in agriculture is an important peaceful use of the atom.

Chairman ANDERSON. Has that been included in the libraries which AEC has been sending to these countries?

Dr. LIBBY. I believe so.

Chairman ANDERSON. So that they can find the information on that, and if they wish to search it out they can find it there.

Dr. LIBBY. Yes, and we fully cover it in our semimonthly abstracts.

Representative COLE. Have many of your agricultural researches resulted in the commercial application of any of your findings?

Dr. LIBBY. You see, these increases or these developments in knowledge immediately come to bear in farming practices. That is, for example, it is an advance of knowledge.

Representative COLE. The chairman spoke of your discovery of rust-resistant oats. Now, can I go down to the seed store and buy 100 pounds of oats that I can put on my farm that won't develop rust? That is what I am inquiring about—if any of your studies have resulted in the commercial application of the knowledge which you gained.

Dr. LIBBY. The answer is "Yes," but on the other question I would like Dr. Dunham to give more details on that.

Dr. DUNHAM. I think that there is enough of that strain available now, so that it is being made available to actual farmers to raise the crops.

Chairman ANDERSON. I can remember, as a young man, reading about a wonderful Dr. Hanson who was connected with one of the agricultural colleges in the Dakotas. He was highly praised because he had gone over to the other parts of the world and hunted out varieties that seemed to grow well, and brought them back to the United States and taken them to areas where the growing season was limited. He had to go to far streams in Russia to find certain plants.

Now, it is my understanding that by this radiation or irradiation of seeds you can almost lay out a whole panorama of what this sort of work would result in, in 50 years of travel all over the earth. You can do it very quickly and I think it is extremely important, and it is a fine work to have been done. I further think that this question of feeding by different devices is of enormous importance, and I have been a little surprised that the Department of Agriculture has not seized onto it, because their function is to gather research material. At least that was their function before their action programs and before they had to support prices, and the Department was purely in the business of researching and then supplying that research to the agricultural colleges, and they in turn to the experiment stations and the county agents.

It is this sort of thing in which many people are interested. I tried to find out something about foliar feeding out in one area, and they said they knew nothing about it. I blame them, and not the Atomic Energy Commission, I assure you.

These libraries that have been sent out, have they prompted any other country to read about this and write back and say, "We would like to know what you are doing in agriculture"?

Dr. DUNHAM. We get inquiries from time to time, and it must be partly as a result of the libraries.

Chairman ANDERSON. I would think so, or I would hope so.

Dr. DUNHAM. We were getting them before the libraries were sent out.

Chairman ANDERSON. Well, it is a very fine piece of work that has been done at Brookhaven, and elsewhere. It promises a bit more to people in areas where the growing season is very short. I have also been interested in the story that this may eventually lead to preservation of fluid milk so that it might remain reasonably fresh for a rather long period.

Dr. LIBBY. I did not know about that.

Chairman ANDERSON. I do not not know if it were true, but if it were true it would be of great importance to a place like Alaska where they pay 60 cents a quart for it because they have to have the cow up there, and they cannot bring the fluid milk in.

It may be possible for many nutritious foods to reach parts of the world where they are not now available.

Mr. STRAUSS. That subject, Mr. Chairman, is touched upon in the next section, the radiation preservation of food, which will also be presented by Dr. Libby.

Dr. LIBBY. I would just as soon introduce it into the record, if you wish.

Chairman ANDERSON. We will insert it in the record.

(Section V referred to follows:)

V. RADIATION PRESERVATION OF FOOD

Panel recommendation 1

That the present program for development of radiation preservation techniques for foods and other perishables be supported at present and projected levels.

Commission comment

The Commission does not suggest any change in the present and projected level of support for this program.

Panel recommendation 2

That those charged with meeting the farm-surplus problem take into account the fact that radiation deinfestation of grains, a technique now available, could lead to greater surpluses.

Commission comment

Although this recommendation is not directed to the AEC, we believe it pertinent to note that widespread use of radiation deinfestation of grains is not expected in the immediate future, and should, therefore, be a consideration in long-range planning only.

Representative COLE. I would like to interrogate you, Dr. Libby, individually, and the Commission if you can speak for them, to learn to what extent you concur with the observation made by the panel when it says in the opening statement under radiation and preservation of food that—

The radiation and preservation of food does not appear likely to replace other methods of food preservation to any substantial extent in the foreseeable future.

Do you concur with that conclusion?

Dr. LIBBY. Well, it is difficult to predict how rapidly these things will develop. However, it seems to me the thing is likely to go about as follows:

The complete sterilization is such a drastic treatment that it may alter the taste, or have some effect which will affect the food from the point of view of its desirability. It will also require the most searching investigation to prove that the food is healthful. This will take years, and it is now underway, as you know. Before such food can be sold commercially, it will be a matter of years before the Food and Drug Administration can permit its sale.

So, certainly, it is going to be years before heavily irradiated food can be put on the market. However, in the long run, I think pasteurization of food is almost certain. This is a personal view. It is almost certain to be useful.

Representative COLE. When you say pasteurization, you mean partial or incomplete sterilization?

Dr. LIBBY. I guess that is a proper definition of it; yes, sir.

Representative COLE. I frankly was somewhat disappointed with the observations of the panel with respect to food radiation. While it did not expressly say so in so many words, they left me with the impression that this is a nice thing to rock along with, and maybe someday it will be of some general benefit to the public, but let us not be in any great hurry to find out about it.

That was the impression the panel's observations left with me, and my own thinking is just the opposite. Without knowing nearly as much about it as they do, I fancy that food preservation through atomic sterilization offers the opportunity of helping more people in the world through atomic energy than any other possible application of it.

Dr. LIBBY. I am inclined to agree with you, Mr. Cole, that preservation to the extent of pasteurization, something like the application Senator Anderson mentioned, is likely to be most useful.

Representative COLE. Something like the director of this study group who told me not long ago that he had roast pork in his kitchen cupboard 4 months, and he brought it out and cooked it the other day and ate it. It had been irradiated, and it tasted all right, and all of the flavor, and he suffered no ill consequences. The results of the experiments that had been going on in Colorado have all been affirmative, for the most part. It indicate great encouragement in this field.

Dr. LIBBY. I agree with you, Mr. Cole. I think that it is very hopeful as a peaceful use, and we, as you know, are requesting some moneys from the Congress to propose a reactor to further this program and we are behind this program.

Representative COLE. For the record, and for public information, what was the cost of that reactor, was it $15 million or $17 million?

Dr. LIBBY. I will have to ask the general manager.

Mr. FIELDS. No: it is about $3 million, as I recall.

Representative COLE. And the location has not been determined?

Mr FIELDS. It has not been determined.

Representative DURHAM. What is the total expenditure on food irradiation in 1956, what is the total expenditure? That is, by the Commission?

Mr. FIELDS. I do not have the expenditure on the operational side in mind at the moment. I could supply that for the record.

Chairman ANDERSON. Would you supply that for the record?

Mr. FIELDS. Yes. This is actually in a request to your committee for authorization, as you will recall. We dealt with this a week or so ago.

(The information referred to follows:)

There is presently included in the Atomic Energy Commission's operating costs for fiscal year 1956, $100,000 for conceptual reactor design studies for food-irradiation reactors. A like amount has been programed for fiscal year 1957 operating costs to continue this work including reactor component development studies. Also in fiscal year 1957 authorization has been requested for $3 million for construction of a reactor in 1957 as a food irradiation source.

It is also understood that the Quartermaster Corps, Department of the Army, has allocated $1,093,000 to date in fiscal year 1956 for research and development in the field of food irradiation. In addition, the Quartermaster Corps has approved an additional $500,000 for this work, making a total of $1,593,000 programed in 1956. The Comptroller of the Army is presently considering this latest increment. Also the Quartermaster Corps has allocated $150,000 for architect-engineer work on an accelerator which will be a part of a proposed food irradiation center. In fiscal year 1957 the Quartermaster Corps has programed $150,000 for an accelerator; $200,000 for design work; $2,950,000 for construction and equipment of which $750,000 is for a food plant and $250,000 for support facilities and $50,000 mechanical and engineering costs not otherwise covered.

The following table summarizes the funding requirements outlined above.

Funds programed for food irradiation activities

[In thousands]

	AEC	Quartermaster Corps	Total
Fiscal year 1956:			
Research and development	$100	$1,593	$1,693
Architect-engineer (accelerator)	0	150	150
Total, fiscal year 1956	100	1,743	1,843
Fiscal year 1957:			
Research and development	100	0	100
Design, construction, and equipment	3,000	3,300	6,300
Total, fiscal year 1957	3,100	3,300	6,400

Representative DURHAM. The expenditure of a large amount comes from the Army and Navy.

Mr. FIELDS. From the Quartermaster, I think.

Representative DURHAM. I think that we should know something about the amounts spent, because they recommend here that it should be supported at present and at projected levels.

Representative COLE. And the possible savings of the economics of food preservation in our Military Establishment, the dollars that can be saved are staggering. Hundreds of millions of dollars can be saved through radiation of our subsistence items, which now are required to be refrigerated, if it can be done. That is just because all of us have a refrigerator and can get fresh milk every day, it seems that this recommendation means that there is no urgency from the standpoint of individual nourishment.

From the economic standpoint, the potential savings in our own public expenditures for the Military Establishment alone seem to me to provide or should provide the basis for accelerating the program rather than just going along.

Representative DURHAM. If you are requested by the Armed Forces to take over whatever job they have, you are in a position to do that, are you not?

Mr. STRAUSS. Yes, sir. That cooperation has been close.

Representative COLE. Do you see where the program could be accelerated?

Dr. LIBBY. I see your point, Mr. Cole. Frankly, I do not at the moment.

You see, when you talk about selling this as food, the principal block is proving that it is healthful, and this takes years of experimental testing and it is one of the uses of this reactor which we spoke about. It is simply to supply enough material for this important testing program, and in many ways this is the block. There does not seem to be any real way of accelerating the matter .

Representative COLE. You say it takes years. Of course, it will take years. We can never be sure with any finality that an irradiated food might not some day produce some harmful consequences to somebody. We have just to balance out that reasonably. All of the experiments that have been conducted thus far with thousands and thousands and thousands of animals, as I understand it, have been affirmative.

Dr. LIBBY. I believe that is true. Is that true, Dr. Dunham?

Dr. DUNHAM. I have seen no reports of studies which indicated that there were detrimental changes. On the other hand, these have not been long-term studies, and the problem which was touched on earlier, this matter of milk, which the small child would start drinking from the day he was weaned, and of an important item of his diet throughout his life is quite a different thing from developing an emergency ration for the military or civil defense which would be consumed in a short period of time, and then you would go back to normal rations.

This is where our concern is, something that would be consumed year in and year out, and considering that it gets a great amount of irradiation.

Representative COLE. That is a natural consequence of your caution, and you should be cautious, of course. However, all indications, so far as I understand, both with respect to animal experiments and human experiments, indicate that irradiation to the degree that irradiation has been used in sterilization is not harmful. So, that everything points the way toward an eventual affirmative use of it, beneficial use rather than red flags being raised.

Dr. DUNHAM. There is no question but what it has an affirmative use.

Representative DURHAM. In your opinion when could you make a final determination, would that be with regard to the half life involved?

Dr. DUNHAM. This has nothing to do with the isotopes.

Representative DURHAM. I am talking about irradiation, wherever it comes from.

Dr. DUNHAM. This is a matter of the irradiation producing chemical change in the food.

Representative DURHAM. But it has a life expectancy, and you know the life expectancy of the irradiation you are using, do you not, for the sterilization of food. I suppose somebody knows.

Dr. DUNHAM. The source of the radiation is not important, and it can be an X-ray machine, or it can be an atomic reactor, or it can be radiocobalt, or what not.

Representative DURHAM. It has a life expectancy, does it not, however?

Dr. DUNHAM. Yes.

Representative DURHAM. Would you hazard a guess that at the end of the life expectancy, of the radiation used, that you could make a final determination and stop this scarce that seems to be present, the feeling that we are getting into something here?

Dr. DUNHAM. It will be a number of years before most of us are satisfied that this is something that everybody should be eating all of the time.

Representative DURHAM. I hope we learn some day about it.

Representative COLE. To what extent have the food processors become interested or shown an interest in this possibility?

Dr. DUNHAM. The food processors have shown a great deal of interest, both the packing industry, meat packing industry, and the large chainstores.

Representative COLE. They have shown an interest?

Dr. DUNHAM. A very real interest and of course, the drug side of the picture, that is another one. I think one of the companies now has a steroid drug which is sterilized with ionizing radiation.

Representative COLE. What is the American Car Foundry doing in this field?

Dr. DUNHAM. I do not know.

Representative COLE. Or American Machinery Co.?

Chairman ANDERSON. Gen. Bedell Smith was in talking about some of that work.

Dr. DUNHAM. I am not familiar with that work.

Dr. LIBBY. I know they are active but I do not know it in detail.

Representative COLE. Someone ought to know something about it.

Mr. FIELDS. I believe they have under consideration the construction of a reactor for irradiation purposes that would be useful in this field. I think this is a part of their consideration. Beyond that my recollection is not clear.

Representative COLE. No firm commitment has been made to General Smith's group to build such a reactor?

Mr. FIELDS. I do not know. I do not believe so at this moment, sir.

Chairman ANDERSON. Has there been discussion of building one?

Mr. FIELDS. My understanding is that it is a research reactor in collaboration with a number of other companies. I do not have the details in mind at this time.

Chairman ANDERSON. That is a whole series of large American industrial organizations. We thought from the way they spoke, it was something that surely would come to the attention of the Atomic Energy Commission.

Mr. FIELDS. I am not sure whether they have requested or asked for a license on this or not. Mr. Price, are you familiar with that?

Mr. PRICE. This is AMF Atomics. It is a subsidiary of the American Machine and Foundry.

Chairman ANDERSON. They are far enough along to apply for an exemption from the antitrust laws?

Mr. PRICE. That is to operate at 5,000 kilowatts heat output, but I do not have any information with me as to whether food sterilization is one of the research purposes. I would be glad to get that and supply it for the record, if I may.

(The information referred to follows:)

The company has applied for a license for a 5,000 kilowatt (thermal output) swimming pool reactor. The documents submitted by the company do not specifically list food sterilization as one of the uses of the reactor. The following is quoted from the design specifications:

"The facility should enable the following types of studies to be performed:

"(*a*) Shielding experiments
"(*b*) Radiation damage
"(*c*) Isotope production
"(*d*) Activation analysis
"(*e*) Neutron diffraction
"(*f*) Exponential experiments
"(*g*) Beneficial effects of radiation."

In a brochure prepared by AMF as a "proposal to industry" for this reactor, food processing including sterilization is listed as one of the "examples of what nuclear radiations and radioactivity from a reactor can do in the various fields of industry * * *"

Representative COLE. Do you know whether the fuel that would go in this reactor, the gamma business that goes in that reactor, the price is so high and prohibitive that they cannot arouse any interest in going ahead with it, and do you know anything about that?

Mr. PRICE. I did not know that, sir.

Representative COLE. For myself, I hope the Commission exercises as much enthusiasm in this field as it has demonstrated it possesses in the electric energy field.

Dr. LIBBY. This certainly is our intention.

Representative COLE. There are a lot of people in this country that never will use electricity, but they still have to eat, and if they can eat more wholesome food of greater variety, I am sure that that will go a long ways toward correcting some of our social and educational ills.

Dr. LIBBY. We certainly agree with you.

Chairman ANDERSON. We will go to atomic propulsion.

Mr. STRAUSS. The General Manager will present this section.

Mr. FIELDS. In this section the panel had two recommendations. The first is:

> that the Atomic Energy Commission, the Maritime Administration, and the shipping and shipbuilding industries work out a program for exploring the economic feasibility of atomic-powered ships.

Before reading our comment, I would like to read further from their conclusions, from which I believe this recommendation extended. This reads as follows:

> That atomic propulsion of commercial ships is technically feasible. However, economically competitive atomic ships are not generally yet in prospect.

I believe they had that in mind for their recommendation, and our comment is to this effect:

The Commission has been providing technical assistance to the Maritime Commission and industrial groups in their exploration of the economic feasibility of atomic power for merchant ships. When specific design and construction programs are undertaken we would also expect to cooperate fully in the development of their nuclear aspects.

Besides the Maritime Administration, we have been giving some assistance in the form of access permits and information to Newport News Shipbuilding Co., and the Bethlehem shipbuilding division.

Chairman ANDERSON. The Maritime Commission has asked private industry for proposals by mid-March of 1956, on the design of atomic powered oil tanker. What has been the role of the Commission in the development of that nuclear aspect of that proposal by private industry?

Mr. FIELDS. Well, we have worked with them generally in supplying information, and in study groups. They have consulted with us from time to time on this. This proposal that they initiated was on their own initiative, sir.

Chairman ANDERSON. Will the Commission judge the technical feasibility of the proposals submitted?

Mr. FIELDS. We have had discussions with the administrator. They have indicated their interest that we cooperate with them fully in this field. We have indicated that we would do this. They have asked us for comments on certain of the estimates that they are making as to the feasibility of different types of reactors, and the costs of these installations, and we are supplying these.

There is collaboration with them, sir.

Chairman ANDERSON. Can these private industrial groups participating in this program make the best proposals possible at this time

if all of the information on the military propulsion program is not available to them under the present access system?

Mr. FIELDS. There is a great deal of the technology that is available to them from the military reactor projects. We do not believe it should inhibit them. There are some, I believe, who are concerned that they do not have access to the complete information.

Chairman ANDERSON. Would this access system effectively limit the competition in this field to firms that are already involved in the naval reactor program?

Mr. FIELDS. I do not believe it would limit them, other than that they would perhaps have more background in the field.

Chairman ANDERSON. How would the others get the information?

Mr. FIELDS. Through the access permit program they would get a lot on the technology.

Chairman ANDERSON. It would be satisfactory for them to handle the bids on it?

Mr. FIELDS. It is satisfactory except in one sense: that they have in their own mind no knowledge of what the complete information is and there is a reservation in their mind.

Representative COLE. I recall, Mr. Chairman, that representatives of Bethlehem Shipbuilding Co. were before the subcommittee 2, 3, or 4 weeks ago, discussing this subject of ship propulsion and they did not indicate any limitation on the mount of information that they could get from the Commission. They appeared to be quite satisfied; or at least they were not critical of it.

The substance of their opinion was to corroborate and confirm the opinion of the panel when they said—or when the panel said—that economically competitive atomic ships are not generally now in prospect.

Mr. FIELDS. The panel recommendation No. 2 is:

That the Commission cooperate within the limits of national security with any industrial efforts to develop atomic locomotives.

The Commission has cooperated with industrial studies of atomic-powered locomotives and other prime movers. Much useful classified information is available under the access permit program. Under current study at this time is the question of whether information resulting from the development of nuclear military propulsion plants can be made available under access permits. The Commission does not anticipate making a significant expenditure in research and development in this area until technological developments solving some of the problems outlined in the report have improved the prospects of the practicality of atomic locomotives.

We have three permit holders who have expressed their interest in atomic locomotives: the Baldwin-Lima-Hamilton Corp., the Denver Rio Grande Western Railroad Co., and the General Motors Corp.

Representative COLE. Have you had any interest expressed of a similar nature with respect to atomic-powered automobiles?

Mr. FIELDS. I do not believe we have, sir. That is, that I know of. Mr. Davis corroborates that, sir.

Representative COLE. Do you see atomic-powered locomotives in the foreseeable future?

Mr. FIELDS. I do not. Perhaps Mr. Davis would elaborate on that.

Mr. DAVIS. No, sir; I do not either.

Representative COLE. Do you see atomic-powered automobiles on the highways in the foreseeable future?

Mr. DAVIS. Not within the foreseeable future.

Chairman ANDERSON. Was your answer "No" on locomotives?

Mr. DAVIS. Yes.

Chairman ANDERSON. Some of the railroads have changed their minds pretty substantially on that in the last 6 months, have they not? Weight is not a factor; it is an asset to them; is it not? Those lines which operate over substantial areas have expressed quite a little interest in it.

Mr. DAVIS. The weight is not a factor. The size is somewhat of a delimitation; and certainly, the problem of hazards in particular is a most serious one.

Chairman ANDERSON. If there were a wreck, there would be some problems?

Mr. DAVIS. Yes, sir.

Mr. STRAUSS. I believe, also, that my associates would agree that the development of large-scale electrical energy, and of a very efficient accumulator, would make locomotive propulsion and automotive propulsion with electricity derived from atomic sources something in the foreseeable future.

Representative COLE. How are you going to get automotive propulsion that way?

Mr. STRAUSS. By batteries and by accumulators charged with electricity from an atomic-powered reactor.

Representative COLE. That is what you meant?

Mr. STRAUSS. Yes. I think to discount that as a possibility in the future would be a mistake.

Representative COLE. You are speaking about atomic power that way, rather than direct?

Mr. STRAUSS. I was fearful that our answer might have been too sweeping if it brushed it aside for the foreseeable future in any way.

Chairman ANDERSON. I certainly would agree on the question of automobiles. But I feel that the locomotive may have some possibilities. I know that one very substantial railroad system—and I do not suppose it wants to get involved or I suppose it wants to make its own announcement, but it has changed its attitude a little and is following the activity of the military reactor with a great deal of interest, on the basis of being able to start a freight train at one end of the continent and get it to the other without a stop.

Representative COLE. What are the relative costs? Is that a matter of major concern, the relative costs of the reactor to pull a 50-car train?

Mr. DAVIS. I think the principal thing at the moment would be the hazards. But in addition to that, the costs today, of course, would be very much larger than the costs of a conventional locomotive. This is much the same problem as the problem of building any small reactor and having conventional powerplants. You are getting down into the 5,000- and 10,000-horsepower range which is today an expensive one with a reactor.

Chairman ANDERSON. All right, the next subject is general industrial uses.

Mr. STRAUSS. Would you wish that presented or just introduced for the record, Mr. Chairman?

Chairman ANDERSON. I think—unless there is objection—we will merely introduce it for the record.

Representative COLE. You might indicate if there is any disagreement with the panel's recommendation. Will you focus our attention on any particular items on which the Commission disagrees with the panel? Otherwise, it is all right with me.

Mr. STRAUSS. There are none, I think.

Chairman ANDERSON. In connection with item 8, it would be well to eliminate that and include it in our discussions to see what happens with the work along the line that is now going forward.

Mr. STRAUSS. I would suggest that, Mr. Chairman, and introduce this text, which has already been distributed for the record, and devote perhaps an entire session at a later date to that.

(Chapters VII and VIII referred to follow:)

VII. GENERAL INDUSTRIAL USES

Panel recommendation 1

That the Commission step up fundamental research in areas relating to the use of atomic radiation as a new form of energy for material processing;

Commission comment

The Commission agrees with this recommendation and is considering how it can step up fundamental research in this field. The Commission has sponsored a number of studies of possible use of radiation energy, the most widely publicized of which was the study by Stanford Research Institute into possible uses of radioisotopes generated as waste materials in fuel element processing. The basic work accomplished through these studies has demonstrated to industry the possibilities inherent in the use of radiation energy in chemical processes. We believe that developments of specific applications will be most successful if they are carried out by the industries which are prepared to exploit them. We understand that developmental work is underway by several concerns.

Panel recommendation 2

That the Commission encourage any efforts by private industry to explore promising ideas relating to atomic space and process heating.

Commission comment

The Commission will continue to cooperate with industry in this area. Progress in reactors for other uses will be of substantial benefit to those interested in this field. In addition, work directed toward meeting military space heating requirements will directly benefit prospective civilian uses.

VIII. IMPACT ON THE UNITED STATES OF PEACEFUL ATOMIC DEVELOPMENTS ABROAD

Panel recommendation 1

That the executive branch establish specific research and development goals to meet the needs of friendly nations; and that attainment of these goals be assured by provision of technical services, including the conduct of projects at home and abroad aimed at developing crops and farming methods, medical practices, and education and training in basic science and in applied atomic techniques adapted to the problems of specific friendly nations.

Commission comment

Cooperation in the development of technical programs and research goals and the exchange of information relating to the Commission's research and development activities inthe peaceful uses of atomic energy are among the principal forms of assistance now being given to friendly foreign nations under bilateral agreements for cooperation. The following are examples of the types of specific assistance being provided:

(*a*) Staff consultation with scientists and technicians from cooperating countries;

(*b*) Visits to cooperating countries by Commission teams of diversified talent with the mission of assisting in an evaluation of the ways and means by which peaceful atomic applications might best be realized;

(c) Training facilities and courses designed to provide firsthand knowledge of the basic tools of the art open to foreign nationals;

(d) Technical libraries distributed throughout the free world;

(e) Technical assistance on a high priority basis with other interested agencies and departments in the application of atomic energy developments to agriculture;

(f) Approved tours and seminars for foreign physicians and surgeons at Commission installations and other institutions and hospitals where work in atomic medicine is in progress.

Much of the Commission's domestic research and development activities parallel the requirements of the cooperating countries. The power demonstration reactor projects, particularly the small-scale reactor program, are of immediate interest to many nations and will provide them with valuable information in the development of their own plans for atomic powerplants.

In addition, the Commission's program encompasses broad areas of research relating to other peaceful applications of atomic energy, including medicine and agriculture, which are of worldwide significance. By the means described in the foregoing paragraph the Commission makes available to friendly foreign nations the results of this research. The individual nation then is in position to establish for itself national programs and goals directed toward its particular needs and interest.

The great diversity which exists with respect to the requirements of individual countries throughout the free world makes impractical the establishment in the United States of specific technical and research programs for each country.

Panel recommendation 2

That the Commission center its responsibilities with respect to international development of peaceful uses of atomic energy in one alert, forward-looking organizational unit.

Commission comment

Effective November 13, 1955, the Commission established a Division of International Affairs responsible for planning, developing and coordinating a program of international cooperation as approved by the Commission. In carrying out this function, the Commission looks to the Department of State for political guidance and other assistance.

Panel recommendation 3

That adequate research and educational equipment and facilities be provided to friendly countries, accompanying research reactors sponsored by the United States, so that atomic scientific, agricultural, and medical benefits can be brought to bear promptly where most needed.

Commission comment

The President's offer of June 11, 1955, to share in the cost of research reactor projects undertaken by cooperating countries has been implemented by procedures which contemplate a grant-in-aid up to $350,000 to any individual nation. In a majority of the cases this amount will cover not only one-half the cost of a research reactor but also a portion of the costs of related research equipment and facilities.

Panel recommendation 4

That the United States encourage other nations to decide for themselves the rate at which they wish to apply atomic power and other industrial uses of atomic energy to their own economics, to which end, we further recommend:

I. That the United States promptly convene a series of regional conferences of our bilateral partners for the immediate establishment of realistic goals for the installation of atomic electric generating plants in specific countries;

II. That the United States, in issuing invitations to such conference, announce that it is prepared to furnish nuclear fuels, provide necessary technological assistance, and permit contracts for the installation of at least 1 million kilowatts of atomic generating capacity outside the United States as soon as possible—we hope by 1960. The attention of the world should be called to the fact that such a program would parallel and possibly exceed the capacity installed during thes same period at home;

III. That financial assistance, when required and where justified for this program, be made available through normal governmental and private channels, not through the Commission; and

IV. That atomic power plants constructed under these programs be subject to interim control plans involving appropriate inspection to be agreed upon by each participating bilateral partner, and requiring reprocessing of spent fuel and recovery of plutonium or uranium-233 in the United States; materials thus recovered to be earmarked for further expansion of peaceful uses.

Commission comment

I. A series of regional conferences would materially assist cooperating countries in the establishment of realistic atomic energy goals. The Commission and other agencies concerned are presently studying the feasibility of such conferences and the most effective means for carrying them out.

In order to provide maximum benefits, however, the conferences should not be limited to atomic power and other industrial uses of atomic energy but should cover as well the humanitarian uses. In this way, regional conferences may serve as a useful tool in achieving the objective of the panel's first recommendation of this chapter of the report.

In addition to officially sponsored conferences, the Commission frequently approves participation by Commission representatives in privately sponsored conferences and forums. For example, the Commission will be represented at the World Power Conference to be held in Vienna this coming June.

II. Last Wednesday, the President announced that upon the recommendation of the Commission the President has made available for distribution abroad 20,000 kilograms of uranium-235. This equals the amount of similar material made available in the United States for all licensed civilian purposes, and will support the initiation of nuclear power programs with a generating capacity of several millions of kilowatts. As the announcement stated, the Commission has informed the President that as more nuclear fuel is required in the future to assist additional projects of other nations the Commission will recommend that additional supplies be made available.

This action is considered the most significant single step toward peaceful uses of atomic enegy throughout the world since the passage of the Atomic Energy Act of 1954.

III. With respect to financial assistance, it is the Commission's view that, under proper circumstances, such assistance (other than the special types of assistance referred to by the panel) may significantly advance the peaceful uses of atomic energy abroad. This would be particularly true with respect to humanitarian uses in underdeveloped countries where the cooperation is government-to-government. As a general rule, if financial assistance is to be furnished, normal governmental or private sources should be utilized.

IV. In his announcement of February 22, 1956, the President stated that "distribution of special nuclear material will be subject to prudent safeguards against diversion of the material to nonpeaceful purposes." The Commission is now formulating the detailed procedures for distribution and they will be announced in the near future.

Mr. STRAUSS. The General Manager will present this section with your permission, on the control of information.

Mr. FIELDS. The next section is No. 9, Control of Information.

The panel's recommendation is that the Commission remove all reactor technology from the restricted data category, including such areas as fuel element fabrication and processing techniques, leaving specific military applications of such technology to be protected, insofar as national security is involved, by the defense classification system.

Our comment is this:

The Commission testified in the hearings before this committee on February 7 as to the vigorous efforts underway to review existing documents in order to declassify or downgrade much of the information in the field of reactor technology. As a result of the special review at Oak Ridge which we described in these hearings, some 31,000 classified documents believed to be useful in civilian applications were reviewed. Of these some 11,000 were declassified; some 8,500 were downgraded, and the remaining 11,500 were retained in their original classification.

This special review has added considerably to the unclassified information now generally available and to the classified information available under the access permit program.

The Commission is also considering whether additional areas of information on reactor technology can be made available under the access permit program. In the future, all classified documents of possible usefulness in civilian applications will be reviewed as they are generated, and the documents remaining classified under current rules will be reviewed each time the rules are changed.

At present the rules for the classification of information are undergoing one of the periodic reviews. The work is being done by the staff at the direction of the Commission. The recommendations have not yet come to the Commission.

Among the items being considered in the staff study are (1) greater latitudes in the release of nuclear data; (2) further release of information in the chemical processing field; and (3) complete declassification of all information, even the most advanced, that is primarily concerned with the design, construction, and operation of power producing reactors.

It is expected that information which gives important data on production reactors or on military propulsion reactors will remain classified.

We are not clear as to the intent of the panel in that part of this recommendation regarding leaving specific military applications of technologiy to be protected. insofar as national security is involved, by the defense classification system. We do not believe that under the Atomic Energy Act it is permissible to classify reactor technology that has particular military significance as defense information after the Commission has declassified this information under section 142a of the Act.

Representative DURHAM. You know they have been doing this up to the present time; is that right?

Mr. FIELDS. We have never taken such action; that is right, sir.

Representative DURHAM. It looks to me like that would some way complicate the procedure of us passing on the military data, and all other data, would it not? It would put us in a position of passing on military secret data, top-secret data and all other data; that is, as far as military applications are concerned; would it not?

Mr. FIELDS. I am not sure that I understand your question, Mr. Durham.

Representative DURHAM. From reading the recommendations you have read, it was not clear in the last part of your statement there, in your comments, where you said:

We are not clear as to the intent of the panel in that part of this recommendation regarding leaving specific military applications of technology to be protected.

Now, taking the recommendation that the Commission remove all reactor technology from the restricted data category, including such areas as fuel elements, fabrication, and processing techniques, and leaving the specific military application of such technology to be protected.

Mr. FIELDS. We had intended that would read this way—

Remain protected as restricted data.

Representative DURHAM. But I say the recommendation, of course, is protected under their recommendation, is it not, just like you are proceeding at the present time?

Mr. FIELDS. It would be; yes, sir. However, it would be under a defense classification which different agencies would be applying criteria to, I presume. It would probably apply to the same criteria, but each agency would have the prerogative in the classification itself.

Representative DURHAM. The military could put any kind of classification it wanted to on it, and it might be in conflict with yours?

Mr. FIELDS. That is correct.

Representative DURHAM. That is what I was getting at.

Mr. FIELDS. Recommendation No. 2 is:

That the joint committee reexamine the concept that atomic information in all fields is "born" classified; we believe that this concept is not compatible with the expeditious action required to permit rapid development of peaceful uses of atomic energy; and that therefore this concept should be limited to the design, manufacture, or utilization of atomic weapons.

The Commission's comment is:

The concept of the panel as to what information is "born" classified needs some clarification. Its recommendation can be read to say the members of the panel thought all atomic energy information is considered classified until the particular report or document is declassified. We believe this was not meant, for the panel members know that much atomic information is considered unclassified from its beginning. Clearly, where the Commission has removed specific areas of information from the restricted data category, pursuant to section 142 of the act, information subsequently developed in those areas is not "born" classified.

We assume, therefore, that this in effect is a recommendation that all atomic energy information, except in the weapons area, be treated as "born" unclassified. We also assume, because of the panel's first recommendation regarding control of information, that some atomic energy information of possible value in peacetime uses, for example, special military applications of reactor technology, should be classifiable under the defense classification system.

This approach departs from the basic philosophy underlying the restricted data concept as expressed in both the 1946 and the 1954 acts. It takes from a civilian agency—the Commission—the practically exclusive power, outside the weapons utilization area, to determine what atomic energy information should be protected as sensitive information and what should be declassified and freely disseminated. Thus, under the present defense classification system prescribed by Executive Order 10501, the Defense Establishment would have discretion to determine whether reactor technology developed by it had specific military applications, and to keep classification on it.

Persons could not have access to this information, regardless of its relevance to peaceful uses, except where they had official duties requiring such access in the interest of promoting national defense, and in the discretion of the Department of Defense.

Moreover, under the present Executive order, classified information developed within the Commission's program could only be made available to persons who required the information in connection with their official duties. We believe that this limitation on the availability

of information relating to peaceful uses of atomic energy could be most unfortunate.

We should like to comment briefly about the legal consequences of the fact that restricted data is "born" classified, particularly in relation to persons outside of the Commission's programs. The communication of information involving restricted data does not necessarily subject the communicator to a penalty. The criminal provision of the act that has application to communication of restricted data by any person provides that there must be either an intent to injure the United States or to secure an advantage to any foreign nation, or reason to believe that the foregoing will result (sec. 224). Even in the case of communication of restricted data by a present or former employee of the Commission, any other agency of the United States, a contractor of any agency of the United States, or a licensee of the Commission, the statute requires knowledge or reason to believe that restricted data is involved and that the recipient is not authorized to receive data (sec. 227).

The Commission does not believe that the classification principles prescribed by the 1954 act have interfered with the discharge of its statutory responsibility to encourage widespread participation in the development and utilization of atomic energy for peaceful purposes to the maximum extent consistent with the common defense and security.

Recommendation No. 3 of the panel is as follows:

That the Joint Committee require the Commission to undertake the compilation of both classified and unclassified information relating to peaceful uses of atomic energy on a continuing and current basis so that it can be available in ready reference form to those entitled to use it.

The Commission has carried on, as described in the February 7 hearings before this committee, comprehensive programs of preparing and publishing both classified and unclassified bibliographies, abstract journals, and other reference aids in atomic energy.

The Commission also has compiled special volumes for ready reference use such as the reactor handbooks—4 books of technical data put together at a cost of $350,000. McKinsey & Co. in the report on their survey of the AEC's role in the peaceful uses of atomic energy, stated that—

These services have been well developed and have been of considerable assistance to those already in or contemplating entering the field of civilian application.

Such services will be continued and amplified.

Representative COLE. Would you tell me a little bit more about McKinsey & Co. and their survey? How are they qualified to pass on the adequacy of the Commission's program?

Mr. FIELDS. This is a comment that they made in the course of a management survey they conducted for us, sir. They looked rather in great detail as to our methods of handling civilian applications, and this was one of the items we had them looking into. It was the availability of information and our measures for making it available.

In July 1955 the Commission expanded its compilation program. In its recent testimony before the committee the Commission reported 11 volumes of new compilations—3 to appear as unclassified volumes only, 4 to appear as classified volumes only, and 4 to appear in both classified and unclassified versions. Contract preparation of 6 of

these volumes is now underway and contracts for the remaining 5 are to be let this fiscal year. Contracts for still others are contemplated in fiscal 1957.

There is another problem—providing current information through periodical literature—which the panel may have intended to pose in its recommendation. We do not believe that this problem arises for unclassified information. It is present in the field of classified information.

UNCLASSIFIELD PERIODICAL DISSEMINATION

From the beginning, the Commission has encouraged the authors of unclassified papers coming from the Commission's program to publish them in the recognized scientific, technical, and professional journals. Technical men in science, engineering, ad industry rely on these journals as their chief medium for interchange of new information in all lines. Publication in them has proved effective and useful.

CLASSIFIED PERIODICAL DISSEMINATION

The Commission in 1948 established a classified journal covering subjects in science and technology related to reactor development. It is still published and available to access-permit holders.

To investigate other possible requirements for current classified reporting not satisfied by the topical progress reports, the Commission is surveying the needs for establishment of other classified journals, particularly for access-permit holders in private industry.

The survey is to compile the opinions of firms and persons in the access-permit program as to their needs for such service. The views of Commission contractors and staff on the feasibility as well as the need for such journals also will be gathered. If found desirable and feasible, the Commission will consider establishing other classified journals, at least in the confidential classification to pull together material otherwise scattered through the current AEC report literature, or delayed in publication because it does not warrant the issuance of a topical report.

Chairman ANDERSON. Let us stop there for just a second. The very first page of this, on the control of information, says, "As a result of the special survey at Oak Ridge, some 31,000 classified documents believed to be useful"—who decides what is useful and what is not useful? Has industry the right to say what is believed to be useful?

Mr. STRAUSS. I believe the reviewers make that preliminary determination, Mr. Chairman. Can you confirm this with any details, Mr. Fields?

Mr. FIELDS. From a knowledge of the type of information, the reviewers, our technical information service, as well as the Classification Division personnel review this to see what is pertinent to reactor technology and the peaceful uses program. We have, of course, a lot of reports in other areas that might be pertinent in certain aspects, but such as weapons reports or matters of this nature that obviously would not be considered.

Chairman ANDERSON. If industry does not know what information is available, how can it indicate whether it thinks that information would be useful to it or not?

Mr. FIELDS. We know the general areas that they are interested in rather completely, I would say, and by just looking at the reports we have we can tell that.

I do not know how you assure them that we searched every record we have to find that.

Chairman ANDERSON. The Commission decides what is useful, instead of the person who wants to use it? Or the industry, that would apply the same way.

Mr. FIELDS. With this large volume we reviewed, and listing these in periodicals, and abstracts, and giving these lists that we have quite covered the fields that we have in these areas, they can know all of these volumes here that we have dealt with, and express an interest in them, through the access program.

Chairman ANDERSON. You have some 31,000 classified documents, and about 8,500 of those were downgraded. Were most of those available to access permit holders?

Mr. FIELDS. Yes, most of them. The 8,500 that were downgraded, would be available to the L clearance access permittees. Those retained on the secret list, would be for access on that basis. All cleared permittees would be provided the classified bibliographies.

Chairman ANDERSON. Of the 8,500, how many of them were available before the review to secret permit holders?

Mr. FIELDS. They all were available to secret permit holders.

Chairman ANDERSON. Now, they are all available to L permit holders?

Mr. FIELDS. Yes, sir.

Dr. LIBBY. I think on this point, Senator Anderson, it would be well to note that the Office of Classification has an extensive advisory system and the advisers are chosen from industry, and our contractors throughout the country. The senior reviewers, for example, which is a body of advisers, have a broad representation and they have a great deal to say in the way of recommendation about just what we do with this area.

It is implicit in the system where we keep some information classified that we cannot let everyone look at it, but we try the best we can in appointing these advisory committees to bring in these people and fully disclose everything to them, and follow their recommendations almost without exception in these matters.

Chairman ANDERSON. Of the 8,500 which were downgraded, was most of the information of relatively recent origin, or was there a good deal of old material?

Mr. MARSHALL. A fairly large percentage of the information that was downgraded to confidential was of origin over a year or two old. A good percentage of the information is new but not the major part of it.

Chairman ANDERSON. Would you say that much of the information declassified or downgraded was significant to the progress of the peaceful applications, or was most of the information of minor importance?

Mr. MARSHALL. Well, it would be very difficult for me to say, Senator, whether the information was of minor importance or not. We felt that these documents that were downgraded or declassified were of interest to the peaceful applications, that is, to the industrial

groups that were interested in this, and so we reviewed them. However, I do not know whether they would consider them to be of minor importance or not. We just made them available.

Mr. STRAUSS. It is premature until one sees what use is made of them by industry to evaluate their relative importance.

Chairman ANDERSON. Well, at the top of page 29, the Commission states:

> In the future all classified documents' possible usefulness to certain applications will be reviewed as they are generated.

Do they have to be generated classified to begin with in all instances?

Mr. FIELDS. No, sir, there are certain areas which have been established as unclassified. This is largely biology and medicine fields, basic chemistry and basic physics, and instrumentation and a fairly large amount of material in the raw materials processing area. Material is not "born" classified in those particular areas.

Mr. STRAUSS. That was discussed, Mr. Chairman, in the comment on panel recommendation No. 2. I think you were out of the room just at this particular point.

Chairman ANDERSON. I am sorry, I was out of the room at that time.

Mr. STRAUSS. However, I think that you will find it there, sir.

Chairman ANDERSON. Thank you. Are there some additional questions?

Representative DURHAM. In the beginning of the panel recommendations, they recommended removal of all reactor technology from the restricted data category.

Mr. STRAUSS. Where are you reading from?

Representative DURHAM. That is on page 28, the first recommendation. There is a long explanation here, and I do not get too much information out of it, and exactly what your opinion is on such a recommendation. How do you feel about such a recommendation?

Mr. FIELDS. Mr. Durham, I believe our comments were intended to say something to this effect: You will note the panel recommendation says:

> Consider all information, leaving specific military applications of such technology to be protected.

They go on saying defense information, but they meant to say to leave it protected. That is what we are saying on page 29, that we are looking at. We are taking a new look at this guide, and we are looking at this question of greater latitude in the nuclear data to be made available, and information in the chemical processing field, and all information concerned with design, construction and operation of power producing reactors.

Representative DURHAM. Is it true that in your opinion there is a lot of information in the 11,500 documents still remaining that does have some effect on technology?

Mr. FIELDS. That is true.

Representative DURHAM. That is a clearer answer than you have in your statement, I think.

Chairman ANDERSON. What kind of atomic energy information which would not be covered by defense classification would still be classified?

Mr. FIELDS. Well, the original classification arises from the considerations of national defense. This is true.

Chairman ANDERSON. Would there be any disadvantage in the development of peaceful uses of atomic energy if restricted data as a classification would be abolished, and defense classification instituted, so that you would have to put the test that was necessary for defense?

Mr. FIELDS. This is the argument that we presented with respect to panel recommendation No. 2. That is that we believe it might be a hindrance in the peaceful application programs. To this point, the Commission has been responsible for the classification of restricted data. Now, we have responsibilities in the military application of atomic energy, and we have responsibilities in the peaceful applications, and we believe we are in a little better position to judge the arguments pro and con on a question of classification.

Representative DURHAM. Is it not your primary reason for not declassifying the remaining 11,500 documents, that is entirely or primarily from a military standpoint of security?

Mr. FIELDS. That has always been the basis.

Representative COLE. It is exclusively, and that is the only reason?

Mr. FIELDS. It is exclusively that, yes, sir. It is exclusively that, and the interpretations of the application of that to classification has changed with the years. Back in 1946 practically everything was classified. The criteria on which you judge that has been changing somewhat. These are considerations with which we are dealing.

Chairman ANDERSON. If it is exclusively defense classification, what would be wrong with saying that it is defense classified?

Mr. FIELDS. It is defense classified. It is defense classified in the sense that there the reason for it arises. What they are dealing with, though, is that they recommend the elimination of restricted data, and one classification system within the Government.

Representative DURHAM. We can assume that these 11,500 documents are going to remain classified for a long, long time?

Mr. FIELDS. I am not prepared to say that. This is the question that we are dealing with, in having another look here at the guide, and we are reviewing the question of modification of the present classification guide, and out of that may well come that the bulk of these 8,500 documents will be declassified.

Representative DURHAM. They are primarily classified because you are reviewing them?

Mr. FIELDS. They are reviewed because of the present guide requiring a classification of them.

Representative DURHAM. What I am trying to get at, is this, General: You are reviewing it or will review it?

Mr. FIELDS. We had reviewed them on the basis of the rules of the present existing guide. Now, this guide, the basis for it and the classifications indicated in it are under review themselves. When we modify that present guide, we will have to review these documents again to see if then they can be declassified.

Chairman ANDERSON. When you review the guide, will industry have a chance to consult with you as to this, and express its need for material that you may now have put under restricted data slogans, even though it is primarily not military? They have Q clearances, and they can look at this.

Mr. FIELDS. That is correct.

Chairman ANDERSON. Do you have an advisory committee on the review of the guide, in other words?

Mr. FIELDS. Yes, but it is not an industry advisory committee in the sense that you were discussing here.

Chairman ANDERSON. What is it?

Mr. FIELDS. It is a committee of senior responsible reviewers, or of scientists that are closely associated with our project.

Chairman ANDERSON. Does industry have any representation?

Dr. LIBBY. Yes, industry does, sir, that is what I was saying a moment ago. Would it be helpful to introduce the names of the members?

Mr. STRAUSS. They are in our semiannual report.

Chairman ANDERSON. The reviewers that are now passing on this guide, that is what you mean?

Dr. LIBBY. They make recommendations to the Commission, and as I said, we usually follow, almost without exception, their recommendations.

Chairman ANDERSON. But they review the whole question of classification, and they are not doing a job particularly on this guide. Who is doing that?

Dr. LIBBY. They recommend on the guide.

Mr. FIELDS. This group had recent conferences on this, and I believe it was about 2 weeks ago, and I believe they have practically formulated their recommendations at this time to us. That is, on a revision of this guide.

Representative COLE. With reference to your statement that you are now giving consideration to complete declassification of all information, even the most advanced that is primarily concerned with the design, construction, and operation of power-producing reactors, that is a rather sweeping subject that you have under consideration, or rather a sweeping gesture of declassification. How soon do you think that will be resolved or would be decided?

Mr. FIELDS. It is a matter of a couple of months. I think it is a matter of 2 or 3 months.

Chairman ANDERSON. Dr. Libby, I asked if industry had representation on that committee of senior reviewers and the answer was "Yes," and I will read you the names. Dr. Warren C. Johnson, chairman, dean of physical sciences, University of Chicago. Is he in industry?

Mr. FIELDS. No.

Chairman ANDERSON. The next is Dr. Thomas B. Drew, head, department of chemical engineering, Columbia University, New York. Is he in industry?

Mr. FIELDS. No, but he is a consulting engineer, and he has good contacts with industry.

Chairman ANDERSON. Lots of people have consulting contacts, and a lawyer is consulted by a firm but he is not necessarily a manufacturer.

Dr. Alvin C. Graves, of Los Alamos, is he in industry?

Dr. LIBBY. No, sir.

Chairman ANDERSON. Dr. John J. Howe, atomic international, North American Aviation, Inc., Downey, Calif.

Dr. LIBBY. He is in industry.

Chairman ANDERSON. Dr. Winston M. Manning, director, chemistry division, ANL, Lemont, Ill. Is he in industry?

Dr. LIBBY. No, he is in the Argonne Laboratory, and as you know the Argonne has close contacts with industry.

Chairman ANDERSON. And, Dr. J. R. Richardson, professor of physics, University of California, Los Angeles, Calif. Is he in industry?

Dr. LIBBY. No, sir.

Mr. STRAUSS. I think perhaps it is wrong for us to leave the impression that declassification is governed solely by an evaluation of the utility of that information to industry.

Chairman ANDERSON. I did not say that.

Mr. STRAUSS. We are not sorting out information on the basis of how interested industry is in it, but on the basis of whether or not it is any longer justifiable to withhold it from the world, and from the American public and the rest of the world, as of military importance. I think, with the other criterion, this would be a committee very substantially composed of industrial representation. It is not.

Chairman ANDERSON. My point was that if you had gone through this and decided that this was of such military importance that it could not be released, and then, if industry might have an opportunity to say, "Now, we would like to question whether that is of military importance."

They can say, "It has been published in Europe, or it has been published here," and what is the military significance of it? They at least would have a day in court there. They do not have that day now; is that not correct?

Mr. STRAUSS. I do not think it is a day in court with these kinds of discussions on an informal basis. They are common and current and they are taking place all of the time.

Chairman ANDERSON. Would you say anything that is now classified as military in this country has been published in other countries?

Mr. STRAUSS. I think the difficulty of saying that, Senator, with any pinpointing, would in itself be a compromise of security. I am sure you can understand.

Chairman ANDERSON. What I am trying to find out is that suppose someone brought you a list of things published in other countries and said, "What is your reason for still classifying these," would your answer only be, "It is of military significance"?

Mr. STRAUSS. I think it could only be answered with reference to a particular thing, and not as a generalization. As a generalization, I would say that the compromise of information largely invalidates its continued protection, but that is only a generalization, sir.

Representative COLE. When you say "compromise," would you say the fact it was published abroad constitutes a compromise of the information?

Mr. STRAUSS. Not necessarily, Mr. Cole. The question of whether or not you were making use of it would still be a matter that might be protected.

Chairman ANDERSON. I think we will recess until 2 o'clock.

Admiral Strauss has asked if he might be absent this afternoon because of another meeting, and permission was granted to him for that purpose.

Mr. STRAUSS. Dr. Libby will conduct the session.

Chairman ANDERSON. That is all right.

We will recess until 2:00 o'clock.

(Whereupon, at 12 noon, a recess was taken until 2 p. m., the same day.)

AFTERNOON SESSION

Chairman ANDERSON. Dr. Libby, before we get into the afternoon session, I asked one of the staff to look up some matters on the recommendation that the panel made on information. If I can just read it to you, you will see what I was trying to get to. The Commission stated in its testimony that it has carried on a comprehensive program of preparing in publishable form classified and unclassified bibliographies, abstracts, and other reference aids in atomic energy. The Commission notes that McKinsey & Co., in their report of the AEC rules on peacetime uses of atomic energy, stated:

> These services have been well developed and have been of considerable assistance to those already in or contemplating the entering of the field of civilian application.

But on a previous page of the report, McKinsey & Co. states:

> What is needed by people interested in getting into the field is not access to documents but organized bodies of information. More attention is needed in the whole information field to determining first what a person needs to get into, for instance, the power-reactor field, and then deciding how the required information can be pulled from various documents and organized in really usable form.

Then two pages beyond that statement there is this further statement:

> The AEC must take a more positive role in aiding the individual who seeks technical information to obtain what will be useful. Little or no assistance is provided or contemplated in leading the prospective new participant in the civilian applications field through what is a veritable maze of scientific and technical data.

That is from page 695, subparagraph 3.

The thing that I was hoping we might get a comment on is that what is needed by people interested in getting into the field is not access to documents but to organized bodies of information.

I think they felt that to say here are 22,000 documents that we have declassified is not much help. It is like being told to read the dictionary. It is sort of disconnected. That is the difficulty with releasing 21,000 documents. Is there any way that it might be organized so that, if a person was looking for a particular thing, he would not have to go through the 21,000 in order to try to find the 1 item that he might want?

Mr. FIELDS. We recognize this as a problem, Mr. Chairman. This is one of the reasons why we are looking toward the preparation of these different compilations in 11 volumes that follow through on the reactor handbook series. This is one of the things we are doing.

Another approach to this is in the biblography line, by getting the publication of bibliographies. We are not completely satisfied with what we are doing, and we are looking hard to see if there are additional steps that can be taken.

Chairman ANDERSON. I think the Chairman made a comment at one time, in an address of his, of people criticizing for releasing too much. They are not criticizing for releasing too much. The criticism is one in which a professor said he didn't know how to start going through this tremendous volume of material that has been released. I am glad that you are going ahead with attempts to break

it down into subjects and topics so that it will be more readily accessible instead of just available.

Mr. FIELDS. Yes, sir.

Chairman ANDERSON. I think that is fine.

Dr. LIBBY. I think you will see a noticeable improvement in the next 6 months or so. It is a difficult task. As we said this morning, we declassified several thousand of these and these have to be collated and assimilated into the literature, and it takes time.

Chairman ANDERSON. Very well.

Dr. LIBBY. On the subject of research and development, the panel's first recommendation that basic research in the universities be given general support is one with which we are in complete and full agreement. The second recommendation is that the Commission be encouraged to place contracts with universities and other private research centers—even in advance of actual construction of such facilities—in order to expand total research efforts and to aid in the prompt establishment of such private research capabilities; should additional contract authority be necessary, appropriate amendment of the 1954 act should be made promptly. The Commission has placed research and development contracts with universities and other private research centers in advance of actual construction of facilities. This has been done, however, only when the Commission had a need for specific research or when it was considered desirable to support the research project because of the Commission's interest in it.

Consideration is currently being given within the executive branch to the proposal of an amendment to section 31 of the act which would specifically authorize the Commission to make grants and contributions to the cost of training reactors and other equipment necessary for educational and training activities at colleges and private research centers.

Representative COLE. I don't read into section 31 (a) a construction that would limit the Commission's authority by contract to grant assistance in any fashion if it is for the purpose of research.

Dr. LIBBY. I would like to refer this question to the General Counsel.

Representative COLE. If your uncertainty is with respect to the authority of the Commission to enter into contracts giving assistance for the purpose of training, that may be something else. But since you seek to place this amendment under section 31, which is titled "Research Assistance," I think that your purpose was not to change the law just to accommodate training.

Mr. MITCHELL. Mr. Cole, it was partly on the element of training that we thought we should have some more specific mandate from the Congress than we have today. Then with respect to reactors, we wanted to be sure that we were not running afoul of section 169. We thought probably that if we were doing this by way of contribution and not by contract again if we were embarking on any program, we ought to have a mandate from the Congress before we did it.

Representative COLE. If there is any serious uncertainty it ought to be clarified. We feel that the Commission should exercise its authority in the direction of giving any encouragement it can, notably to research, and incidentally to training.

Chairman ANDERSON. The third recommendation.

Dr. LIBBY. The third of the panel recommendations was:

That the Commission be encouraged, and, if necessary, required to state its research and development objectives and programs in detail on a current basis so that industry can have a firm base in knowledge on which to make its decisions.

The objectives of the Commission's research and development have been stated to some extent in the budget presentations to Congress, the semiannual reports to Congress and by other means. The Commission will consider the feasibility of stating more definitively its research and development objectives and programs and the means of making such statements available to industry. We believe the committee recognizes the difficulties in attempting to keep current specific statements of research and development objectives as by the very nature of this work frequent shifts in activities have to be made in order to take maximum advantage of new findings as they are derived from efforts in this field.

I think one might paraphrase that we would like to do what the panel requested, but it is an extremely difficult thing, especially in the more fundamental aspects.

Representative COLE. It could be very misleading, could it not, if you mentioned an experiment in research in detailed fashion, and a few days after the announcement you discovered something new or you propose something else, or abandon, or enlarge it.

Dr. LIBBY. Yes, sir. I think we can follow the recommendation in the more applied aspects.

Mr. FIELDS. With respect to the point you were making, Mr. Cole, to try to state these objectives might lead to conservatism. If you state a goal, I don't know what the full impact might be. You might get very conservative in your statement of what you are going to do. This could even have an inhibiting effect if you are not very careful.

Chairman ANDERSON. Could it not also be true that if you announced your program you might get some interesting thinking from groups all around the country?

Dr. LIBBY. Yes.

Chairman ANDERSON. For instance, on the high particle accelerator, you have one group of people that want to take it on and another group does.

Dr. LIBBY. In a sense we do that, Senator Anderson, in that the scientific community, except for classification hindrances, is pretty well informed of what is going on in our laboratories and contracts. The contracts at universities are spoken about as freely as any other research that is done.

Chairman ANDERSON. If they are kept pretty well informed there is not much objection to your stating it.

Dr. LIBBY. That is in the research. I thought in the development we had been doing a fair job of stating what our objectives were. But maybe we could do a better job.

Representative COLE. I thought the point of the panel's recommendation was that your programs be explained in detail. It is with respect to that point that I raise some question.

Dr. LIBBY. We are a little loath to go that route, I am afraid.

The fourth recommendation was:

That the present Commission laboratories continue to be supported as vital national assets for assuring the expeditious exploration of atomic energy. For exploration of our peaceful atomic resource, these laboratories, however,

must be used to encourage non-Commission research capabilities as they develop. Their objective must continue to be research at the frontiers so that they can make the maximum contribution to peaceful and military applications of atomic energy.

The Commission is thoroughly convinced that for many years the national laboratories must have a strong and vigorous role in the peacetime development of atomic energy. We note that the panel in the discussion in chapter 12 recognized the complex problems which confront the Commission in achieving the objectives stated in this recommendation.

The national labs are our principal assets, and we have to keep them strong.

Chairman ANDERSON. Are there any other questions? If not, we will go to section XI. Dr. Libby.

Dr. LIBBY. Section XI, Manpower; Education of the Public and the Individual.

Panel recommendations 1, 2, 3, and 4:

The encouragement of orderly and determined efforts on the part of all concerned to increase the output and improve the quality of scientists and engineers capable of contributing to the development of peacetime atomic uses;

That the Commission continue support of university research and graduate study; we urge that private enterprise likewise give them support;

That the facilities of the national nuclear laboratories be made more widely available to support college training programs; and

That recognition be given to the need for additional research reactors and other facilities. In addition to facilities required for use on college campuses, we would consider it wise to design, locate, and operate future research facilities, and especially reactors, in such way that they can be of the greatest use to the greatest number of college and graduate students.

The Commission agrees with these recommendations. In the recent section 202 hearings before this committee, the Commission outlined its current and planned activities toward increasing the supply of scientists and engineers for the national atomic energy program.

Chairman ANDERSON. Section XII.

Mr. FIELDS. On section XII, sir, "Hazards," "Protection," and "Insurance," the first panel recommendation is:

That the Commission be encouraged to step up its program of research into the causes, effects, and control of atomic hazards; the 2 or 3 years remaining before any full-scale "demonstration" atomic powerplant comes into operation must be used to obtain the maximum amount of information in order that both of those concerned with protection against harmful levels of radiation and those concerned with providing insurance to cover such damage as may occur can have the most advanced knowledge possible at the earliest time.

The Commission is keenly aware of the importance of further research into the causes, effects and control of atomic hazards in order that the maximum amount of information will be available at the earliest possible time. The Commission's program in this area was outlined in the recent section 202 hearings. If at any time it appears that additional expenditure of funds and the time of scientific personnel can be utilized effectively in furthering the program, the Commission will not hesitate to increase its efforts in this area.

Panel Recommendation 2:

That the Joint Committee and the Commission continue to encourage the insurance industry to develop ways of meeting atomic insurance problems entirely within the concepts of private enterprise.

The Commission stated in some detail in the section 202 hearings the nature of the insurance problem and the efforts which had been made by the insurance industry, utility operators, equipment manufacturers and the Commission to bring the problem to a resolution. We are not at all sure that this problem can remain unsolved for 2 or 3 years without impeding the construction and operation of privately operated nuclear power reactors (see par. 4, p. 12 of the report). We think this insurance problem is a serious one. So far as plant coverage is concerned, insurance companies can handle that in what we think are reasonable and necessary amounts but the indefinite question of third-party liability is not yet resolved. We believe that the joint committee should consider holding hearings during this session of Congress looking toward a determination of what type of legislation, if any, is required to meet that situation.

Mr. Chairman, I am happy to inform you that the Commission would welcome joining with you in your seminar proposed for March 12 on this subject which you wrote about on February 24. We think it is timely to do so.

Chairman ANDERSON. Thank you very much for that. Do you agree with the panel's views that possibly 2 or 3 years remain in which to conduct research and so forth, because of the inability to obtain insurance?

Mr. FIELDS. We believe there is a period before these will come into operation. This is clear.

Chairman ANDERSON. Do you think there is any 2 or 3 years to find out about the insurance coverage?

Mr. FIELDS. Not for the insurance program, no, sir. They were talking of the research programs and looking into the reactor design and the measures that you use there in which there is a period, before these are in operation, that you can look at these problems, and it should be as expeditiously as possible.

Chairman ANDERSON. We were talking the other day about the number of reactors that were under way. It is a fine list.

Do you think that any of these reactors will be delayed because of the insurance problem?

Mr. FIELDS. At the moment, I would say "No," but I believe it should be discussed. I say "No" because it is not indicated that there will or will not be steps taken by the Government.

Chairman ANDERSON. Let us put it this way. If the Government takes no steps in the field of insurance, do you think that the 3 or 4 principal ones we discussed the other day—the Consolidated Edison, Commonwealth Edison, Detroit Electric, and Pennsylvania Power & Light—do you think they will all move forward rapidly?

Mr. FIELDS. I would be reluctant to express a categorical answer. I think there is a possibility it would deter some of them.

Chairman ANDERSON. And that being true, you see some reason for having a discussion and seminar and study.

Mr. FIELDS. We certainly do.

Chairman ANDERSON. I think it is fine that the Commission is willing to join with the committee and private groups in trying to get a clearer understanding of this problem.

Representative PRICE. In that connection, you say in the statement that you foresee some difficulty if it is not solved in 2 or 3 years.

Mr. FIELDS. Yes.

Representative PRICE. I wonder if the Commission in addition to being anxious to participate with the joint committee in the seminar, if you have not given some thought to a proposal along this line to help solve the problem.

Mr. FIELDS. We fully intend to give the committee a proposal on this. We are not in a position at this moment to do so, sir.

Representative PRICE. That is what I would like to have. That the Commission be far enough along in the study of this problem to be in a position to make some sort of definite proposal to the joint committee when it does participate in the seminar.

Mr. FIELDS. We will make our best effort to do so.

Chairman ANDERSON. Let us not hold back the seminar if you are not quite ready with the final proposal. I feel this is a field which we are going to have to explore pretty carefully and play it by ear as we go along, and therefore stop to see what we have done.

Mr. FIELDS. We would like to consider a little further as to whether we have a definitive proposal for you prior to that seminar. I think there would be much greater usefulness to come out of that that we would like to be in a position to discuss all the aspects. We would like to reserve on presenting an actual proposal in advance. I think it would be desirable.

Representative PRICE. I am not seeking to commit you to this proposal. But we would like the Commission to give enough study to the problem that it would be in a position to make some helpful suggestions to the joint committee.

Mr. FIELDS. Yes, sir.

Representative DURHAM. Has the Commission consulted with any insurance firms or groups? Have you had any conferences at all with some of the larger insurance companies of the country?

Mr. FIELDS. We have had several conferences with them. Actually we have an advisory committee of insurance representatives that we have met with on different occasions.

Representative DURHAM. That is, private insurance companies.

Mr. FIELDS. Yes, sir.

Representative PRICE. I would like to state that I today introduced in the House a bill to bring this thing into the open, with a proposal that the Government accept some form of liability for at least a period of 10 years in this program. I am not completely impressed with the idea of it, but I would like the Commission to examine very closely this legislative proposal that I have today introduced in the House.

Dr. LIBBY. We certainly will.

Mr. FIELDS. Yes, sir.

Chairman ANDERSON. Section XIII.

Mr. FIELDS. Yes, sir. On Ownership of Special Nuclear Materials, Licensing, and Regulation, Panel Recommendation 1:

That the Joint Committee on Atomic Energy create statutory devices to insure a continuing review of the present policy of Federal ownership of all special nuclear materials in anticipation of the establishment of private ownership.

The Commission has not had sufficient experience in the leasing of special nuclear materials to licensees to draw any conclusions as to the desirability of dispensing with the system of Federal ownership. The Commission will continue to keep this matter under consideration. In the meantime, it does not appear that any purpose would be

served by statutory devices to insure a continuing review of this problem.

Panel recommendation 2:

That the 1954 act be amended to permit initiation of proceedings for the determination of "practical value" as required in section 102, by private citizens as well as by the Commission, limiting the definition of "practical value" to technical considerations.

This recommendation proceeds on the assumption that the issuance of a license under section 103, unlike the issuance of a license under section 104, is not subject to the availability of material (see pp. 230–232 of the report). However, section 53f of the act provides criteria for making material available where the applications for material exceed the supply. The total amount of material made available is limited by the annual determination of the president. It is clear that this section applies to applications for material to be used in facilities licensed under section 103.

While the Commission would not oppose any amendment to the Atomic Energy Act to permit initiation of proceedings for the determinations of "practical value" by private citizens, there does not appear to be a need for such an amendment. Certainly the Commission would give serious consideration to a request by any person that a particular type of facility be determined to be of "practical value" for industrial purposes. In fact, whether or not there was any suggestion from an external source, the Commission would feel obliged to make the determination of "practical value" when the facts relating to a particular type of facility warrant.

The suggestion of the panel that the determination of "practical value" be limited to technical considerations is unrealistic. If economic factors are excluded, it would be difficult to find a satisfactory yardstick by which to measure "technical feasibility." The determination of "practical value" would become meaningless and most of the currently proposed research and development facilities would be licensed under section 103. If it is found desirable to exclude economic factors from consideration, it would seem more realistic to eliminate the requirement of a finding of "practical value" entirely.

Panel recommendation 3:

That the Commission, and other appropriate Federal departments and agencies, work with State and local authorities to establish uniform safety and health regulations and enforcement relating to peaceful uses of atomic energy.

We fully concur in this recommendation. As indicated in our testimony at the section 202 hearings, we are making every effort to cooperate with State and Federal authorities in the fields of health and safety regulations.

We believe that it will be possible to develop a program of cooperation with the States which will result in uniform safety and health measures. On February 20 and 21 we had a meeting with our Advisory Committee of State officials. As a result of this meeting it appears that the States are primarily interested in being kept fully informed of the Commission's activities in connection with the licensing of atomic energy plants; they want the Commission to recognize the important interest of the States in this area of health and safety; and to these ends they would like to work with us in the development of a program of cooperation in this field. We are confident that such a program of cooperation with the States can be developed.

Panel recommendation 4:

That the Joint Committee on Atomic Energy reevaluate now the propriety of the controls on the activities of American business in foreign countries imposed by section 57a (3) of the 1952 act, over and above those controls established by other provisions of the act relating to control of information.

As pointed out by the panel and as discussed in detail by the Commission during its presentation in connection with the section 202 hearings, the Commission has issued a general authorization for the conduct of activities outside of the United States on unclassified basis. Unless it appears that industry is encountering serious difficulties under this authorization, there would seem to be no need for considering the question of whether legislative changes are necessary.

SECTION XIV. FINANCIAL ENVIRONMENT

Panel recommendation 1:

That the Joint Committee review the 1954 act, in light of the priorities for development of various peaceful uses set forth in our report, with a view to providing clear guidance to the Commission on the relative priorities of military and peaceful uses and between various peaceful uses.

The principal areas under the control of the Commission in which problems may arise as to the relative priorities of military and peaceful uses, and between various peaceful uses, are: (1) The availability of source and special nuclear materials in relation to the overall military and civilian demand; (2) the availability of AEC facilities and personnel for programs related to peaceful uses being conducted either by AEC itself or by industry.

It is the belief of the Commission that peaceful uses will not be limited by the availability of materials under any foreseeable circumstances. If this should arise, section 53f of the Atomic Energy Act of 1954 provides guidance to the Commission where applications by licensees for special nuclear material exceed the amount available for distribution.

In the area of making AEC facilities available, two types of priorities might arise: (1) As between private applicants for use of Commission facilities, and (2) as between civilian and military research tasks. The Commission has adopted a policy which provides that to the extent Commission facilities are available for private uses, applications will be treated on a first-come, first-served basis.

I should qualify that, however, if a number come in concurrently on a equitable basis of priority between them.

As to the priorities between military and civilian research, the act presently provides direction. Section 1a states that the development of atomic energy shall at all times be subject to the primary objective of making the maximum contribution to the common defense and security.

It should be observed, however, that the development of the peaceful uses of atomic energy is not so much dependent on these priorities as on the advances achieved in the aggressive research and development program now being carried on, the potential economic gains, the extent of industry participation, and the overall availability of technical manpower.

Panel recommendation 2:

That the Commission provide financial assistance under section 31 of the 1954 act for the conduct of research involved in one "demonstration" of each major type of utilization facility insofar as such assistance proves essential to private participation in such projects.

Each of the eight reactors concepts now under development by AEC has been proposed for incorporation in a full-scale plant. Under the power demonstration reactor program, the Commission has announced that it will consider providing assistance to the proposers in various forms, including assistance through research and development contracts under section 31 of the act.

The power demonstration reactor program of the Commission is directed toward the goal of achieving one demonstration of each major type of utilization facility, as soon as the decision to proceed with such a demonstration can be made on reasonable technical grounds. Under this program, industry itself has been encouraged to select the reactor types which it desires to build and to propose the extent of AEC research and development assistance which might be required in each case. The program has been conducted in this manner in the belief that, in this way, the reactor types which are technically farthest advanced and nearest to economic competitiveness will be given first attention under conditions which assure the greatest amount of industry participation and economic incentive. If at any time it appears that demonstration of one or more reactor types of real promise is not being carried out under this program, prompt action will be considered to help assure that these types are not overlooked.

Panel recommendation 3:

That the Joint Committee, in considering future Commission requests for long-term contract authority for the procurement of materials and services from industry as an alternate to building additional Government facilities, bear in mind that in some cases it may be unsound to encourage private enterprise to focus its attention on Commission military needs not compatible with the ultimate direction of peaceful uses.

At the present time the Commission is considering whether any additional legislation is needed to permit long-term contracts for materials and services.

The Commission is aware of the possibility that in some cases the procurement from industry of the materials and services required by the military program could lead to the development of private facilities not ideally suited to the ultimate requirements of a civilian atomic industry. In many cases, however, military requirements are of such type and quantity that their procurement from industry will provide a powerful encouragement of a particular segment of a peacetime industry in a needed and logical direction. The determination can be made only by careful review of each case.

The programs which we have undertaken or announced so far for procurement of materials and services from private industry, we believe, are compatible with the long-term direction of peaceful uses.

This is in reference to the feed materials proposals and chemical processing proposals. These matters we have gone forward with recently.

Panel recommendation 4:

That the Commission waive all charges for fuel used in experimental, medical, research, and "demonstration" facilities where such facilities are owned by nonprofit institutions and used substantially for educational or medical purposes.

The Commission has adopted a policy of assistance to nonprofit educational and medical institutions, with respect to research reactors and subcritical training facilities, through waiver of use and burn-up charges on special nuclear materials; use charges on heavy water; providing funds, or services without charge, for fabrication of fuel elements, preparation of fuel solutions, reprocessing of fuel after use, and acquisition of neutron sources.

Panel recommendation 5:

That the Commission recognize that military requirements for uranium are the present reason for ore-price guaranties and that a free market should be the objective for the era of expanded peaceful uses without guaranties; that the Commission, as an alternative to price guaranties in accomplishing the transition to a free market, consider tonnage guaranties based upon military requirements; any guaranties should be reviewed annually and extended on a 5-year moving basis only if justified by military requirements.

The Commission agrees that the Government purchasing program for the period beyond March 31, 1962, the expiration date of the present ore-purchase program, should provide for transition to a free market in uranium when a sizable demand exists for peaceful purposes. It should be recognized, however, that for power reactors alone, the anticipated need for enriched uranium from the Commission-owned gaseous diffusion plants will require the Government to be an important purchaser in any such market. It is necessary that any program which may be considered not only assure fulfillment of military requirements but also, and fully as important, provide incentive to continued exploration and development, without which known ore reserves could be dangerously depleted. It follows, therefore, that such a program should provide a market for all or part of any production which might result from new discoveries.

In studying the feasibility of extending Government guaranties, the Commission will consider the panel recommendation, and modifications of it, along with other alternatives designed to accomplish the above objective. From a preliminary review, however, certain observations seem pertinent.

It would appear, for example, that the plan does not provide the individual uranium producer with any assurance that he would be able to market all or any part of his production—it merely provides for establishing yearly a total quantity which the Commission is prepared to purchase for the succeeding 5-year period to meet military requirements. If these requirements are equal to or less than the short-term capabilities of existing producers there would be no incentive for capital investment in new facilities or for exploration for new deposits. The demand might be met merely through operation of some existing facilities accompanied by depletion of known reserves. On the other hand, existing producers would nevertheless be faced with uncertainty on the probability of being able to market their output as a result of possible new production or expansion of a competitor's facilities.

In order to lessen this uncertainty it would be necessary to establish some type of allocation system in order that all producers would have an opportunity to sell at least part of their production. Under such a system the individual producers would have no assurance of an allocation sufficient to maintain operations at an economic rate. If new producers were to be given an opportunity to share a limited

market, an allocation of the amount of uranium to be purchased in any particular year could not be made until shortly before the beginning of that year. As a result, industry would be in a continual state of uncertainty.

The above comments are made on the assumption that for the period 1962–66 there will be no significant commercial market as compared with the production capability. Unless there is an adequate, continuing exploration program, there is no assurance that the supply of uranium will meet the long-range military and commercial demand.

It is inferred from the panel's report that for the period following March 31, 1962, the Commission will not establish uranium prices but purchase uranium at the market price. If this assumption is correct, there will be no significant commercial market and there will be no basis for determining a market price. Certainly the Commission's purchases should not be determined on the basis of commercial sales representing only a few percent of total available production.

On page 131 of the report, in discussing the price of special nuclear material, the panel recognizes that a substantial commercial demand is the prerequisite for a commercial market when the major portion of the business is in the hands of the Government. This observation is much more applicable to the uranium-mining industry, which is almost a completely financed and operated private industry, with capital investment running into the hundreds of millions of dollars and with a large number of private operators ranging from large companies to individuals.

In conclusion, the Commission believes that the objectives expressed by the McKinney panel are sound but that further study should be given to the means by which these objectives may be best attained, taking into consideration the need for continued exploration and development.

I would say we are somewhat skeptical as to the approach.

Chairman ANDERSON. You are going to study that further?

Mr. FIELDS. Yes, sir. We are going to study it in considerable detail.

Chairman ANDERSON. It seems to me it would be very useful giving back to us a study dealing with things they have raised. There are many people who participated in that panel study who would like to have the comments on it.

Mr. FIELDS. We do have that under consideration in the present study.

Chairman ANDERSON. The panel concluded at another point:

> If it is assumed that military requirements continue at projected levels, and that present sources of uranium ore operating at planned levels continue to be available, there will be adequate supplies of uranium for an atomic-power industry of the size forecast by the higher values of the range shown in figure 1. (Panel Report, vol. 1, p. 35.)

Is that consistent with the statement on page 113 of the paper prepared for the panel by the AEC Operations Analysis Office, where it is stated that 20,000 tons of 308 has been estimated for domestic nuclear power. Are those two consistent?

Mr. FIELDS. I believe they are consistent.

Chairman ANDERSON. Mr. Johnson, you are not worrying about the sufficiency of uranium for the size program forecast by the panel?

Mr. JOHNSON. No, sir, not in the ranges you mentioned or considerably higher ranges.

Representative COLE. Have you considered an overproduction of uranium sources?

Mr. JOHNSON. No, I do not think there is a possibility of overproduction in the programs now in effect taking into consideration that many of the contracts, including the domestic ore-buying program, extend only to March 31, 1962.

Chairman ANDERSON. Would the panel's conclusion still be true if there were a comparable foreign atomic program and a propulsion and space heat and so forth. Do you still think that the answer would be that it is in good shape?

Mr. JOHNSON. Within the range of 20,000 to 40,000 tons, that would be true.

Chairman ANDERSON. I stated at one time, Mr. Johnson, in reply to a question of a man who said to me, don't you think you are going to get too much of it? I said I would rather have it in uranium, and I thought it would be for 1,000 years. For the gold, I was not sure it would be good for 50. You feel that uranium is a pretty good investment, don't you?

Mr. JOHNSON. I do. I also feel that at the present time the sources of production now being utilized probably represent the lower cost material, and that for the distant future it may be necessary to go to higher-cost sources.

Representative DURHAM. Do you agree with this recommendation on the extension on a 5-year moving basis?

Mr. JOHNSON. I have some questions as to the details there. I feel that for our domestic program there should be a 5-year minimum production period with a lead time of from 2 to 4 years for exploration, development, and construction of new facilities.

Chairman ANDERSON. Are you treating the people in South Africa any better than you do our domestic producer when you give them a 20- or 25-year contract, and give our own folks a 5-year contract?

Mr. JOHNSON. No; I do not think so. The domestic program has never been considered as necessarily ending within the published time limits that have existed in the past. As you know, the domestic program has been extended from time to time. One of the reasons for not covering the domestic program with a longer period is that we have in a sense an open-end program, without limiting the number of producers, and it is difficult to forecast what the conditions are going to be 2 or 3 years hence. In case of the South African program, we have specific contacts for specific tonnages.

Representative DURHAM. There is a problem which continually faces us, Mr. Johnson, with reference to giving longer term contracts. It does not only apply to this, but other strategic and critical materials. It is a policy with which I have never agreed. I think we should think about some of these on a long-term basis. You are thoroughly familiar with the idea of closing a mine and then opening it. We are facing that situation right now in a whole lot of programs that are expiring next year. You need not comment on that. That is my opinion.

Chairman ANDERSON. I think the answers that Mr. Johnson gave are going to be somewhat reassuring to the mining industry of the West. They are not designed to be promoter statements at all, but

those people are interested in a good solid investment, and those are reassuring statements.

Mr. FIELDS. The sixth recommendation of the panel was:

That the guaranteed price schedules for the production of special nuclear materials be declassified to make possible public examination of this important financial device.

The declassification of guaranteed price schedules and other prices and charges established by the Commission, together with the related specifications, is currently under study.

Panel recommendation 7:

That the Commission sell radioisotopes at 20 percent of cost for use in all research in the fields of general science, agriculture, and industry, as well as in diagnosis and clinical use in the field of medicine.

The evidence available to use indicates that research with radioisotopes in nonmedical fields is not hampered by the present cost of these materials. Further, we are quite hopeful that the production and sale of radioisotopes will be undertaken by industry as a commercial operation in the reasonably near future. Commission sale of these materials at less than cost could be a serious deterrent to such commercial development.

In the event that future evidence indicates that the use of radioisotopes is being limited by their cost, it is our belief that the necessary support should come through the normal chanenls of private and governmental aid to research.

Representative COLE. General Fields, is there not an argument that you should not reduce the price of isotopes? It occurs to me that if you were to do that, the users of them would come to rely on the Government as a free source of them and for that very reason you would discourage commercial houses from entering into that field.

Mr. FIELDS. That is correct.

Representative COLE. It seems to me that the wiser course is to maintain a charge that has some relationship to your cost, especially when nobody is kicking about it. The customers are not complaining. So why give them a handout, and at the same time discourage the development of a commercial field?

Mr. FIELDS. That is our position, essentially.

Representative DURHAM. You are doing this in the medical field now.

Mr. FIELDS. We are doing it in medicine and for agricultural uses, too.

The last recommendation of the panel in this respect, recommendation No. 8 is:

That the study prepared by the Department of the Treasury be examined as a valuable exposition of important and often misunderstood financial techniques.

The report prepared by the Treasury Department is a very useful analysis of the financial incentives and benefits that are now being or have been provided by the Federal Government to encourage capital investment. We would expect to make the best use we can of the techniques described in the report as it appears desirable and appropriate to do so.

Chairman ANDERSON. On section XV, the patent section, you may recall that the committee had quite a bit of difficulty with the patent section when the bill was being written. At that time we had a gen-

eral understanding that we would deal with the patent section some time later this year. If you don't mind, we will print the patent section at this point because Congressman Cole has been assured that we would have further study on it. It was my thought that we would have further study on the patent section.

Mr. FIELDS. Yes, sir.

PATENTS

Panel recommendation 1:

That the Commission announce its complete interpretation of patent provisions relating to private development of peaceful uses promptly, not on a piecemeal or case-by-case basis.

Although the recommendation refers to patent provisions, it seems to be directed to the provision contained in section 152 that vests the Commission with rights in certain inventions and discoveries made or conceived under a contract, subcontract, arrangement, or other relationship with the Commission. As indicated by the panel, the Commission has taken the position that the mere fact of a license does not bring the licensee within the purview of this section. An opinion of the General Counsel to this effect was published in the Federal Register on February 21, 1956.

Section 152 provides that the Commission may waive its rights to the invention or discovery under such circumstances as the Commission may deem appropriate. The statute provides no general criteria for waivers. However, the Commission has decided in certain instances that where information, materials, or services are generally made available to the public, the inventor should be able to obtain patent rights on inventions or discoveries resulting from the use of such information, materials, and services. Accordingly, the Commission has announced a waiver of its rights under section 152 with regard to access to restricted data under the access permit program (10 CFR 25). As a condition for receiving access to restricted data, the regulation requires access permittees to waive any claims for damages resulting from the issuance of a secrecy order against any classified inventions and for damages under section 173, of the 1954 act. In addition, the Commission has stated that it retains no rights in inventions or discoveries resulting from the sale or distribution of radioactive or stable isotopes or the sale of irradiation services.

A general determination of the various circumstances under which the Commission will waive its rights is not feasible until the Commission has had further experience under this provision. It may be that, even in the future, it will be possible only to enumerate the areas in which the Commission has affirmatively decided that a waiver is appropriate, since it will be extremely difficult to project in advance all the conceivable circumstances in which a waiver might or might not be appropriate.

Panel recommendation 2:

That the Commission notify inventors promptly as to the intention of the Government with regard to the filing of applications for patent rights in foreign countries on inventions to which title in the United States rests with the Commission and authorize the inventors to file applications for patent rights in foreign countries where the Commission chooses not to do so.

With regard to the filing of foreign patent applications, it should be recognized that an important element is whether the subject matter of the patent application involves restricted data. Where an unclassified

invention arises out of a contract with the Commission, the Commission either undertakes to file for a foreign patent itself or encourages the contractor to file for such patent application with the respective rights between the Commission and the contractor being determined pursuant to the contract.

In the case of inventions or discoveries involving restricted data, foreign patent applications can only be filed where the data involved falls within the scope of the data exchangeable pursuant to an agreement of cooperation. Where the subject matter of the foreign patent application falls within the scope of an agreement for cooperation, a foreign patent application may be filed under the appropriate security safeguards. Again, the Commission either files the patent application itself or encourages and assists the contractor to file the application.

The Commission has attempted to act promptly in all such cases, and the Commission is not aware of any instance where foreign patent rights have been lost or jeopardized because of undue delay by the Commission in notifying the inventor of its intentions where the inventor has indicated an interest in filing foreign patent application.

Panel recommendation 3:

That the complete review of the patent provisions of the 1954 Act by the Joint Committee be set aside until the expiration date relating to the reserve power compulsory licensing provisions in section 153 (h)—September 1, 1959—is close at hand. There are many other important policy issues which require more prompt attention.

As the Commission has already indicated in its report submitted in connection with the section 202 hearings, we have not had sufficient experience with the patent provisions to be in a position to suggest any changes in those sections. Thus, it appears reasonable to the Commission that there be no review of the patent provisions at the present time. Whether or not such a review might be desirable before 1959 the Commission is not now in a position to suggest.

SECTION XVI. GOVERNMENT ORGANIZATION

Panel recommendation 1:

That the Commission provide a real focal point within its organization at which are concentrated authority and responsibility for defining the integrated objectives for research and development of the peaceful uses of atomic energy, both at home and abroad, for establishing definite requirements with time scales for accomplishment of these objectives, and for assuring expeditious execution of the necessary programs and projects.

The Commission has taken a number of steps to aline its organizational structure to meet its increased responsibilities to promote the peaceful uses of atomic energy. The Division of Civilian Application was first established as the Division of Licensing and assigned responsibility for developing and administering the regulations required to be issued under the Atomic Energy Act of 1954. Its charter was later broadened in order to make it functionally responsible in collaboration with other program divisions of the Commission as the focal point of contact by industry for assistance in the peacetime applications of atomic energy. In developing the necessary regulations, this Division worked closely with industry and became acutely aware of the problems facing industry in assuming its proper role in the

peaceful uses of atomic energy. Therefore, it seemed particularly appropriate to assign this broader responsibility to the Division.

The emphasis given to international cooperation in the Atomic Energy Act and the very considerable increase in activities in this area lead the Commission to establish a Division of International Affairs whose primary functions relate to the Commission's responsibilities in international cooperation programs for the peaceful uses of atomic energy.

Representative COLE. Who is the director of that Division?

Mr. FIELDS. Mr. John Hall.

Representative COLE. When was it created? Was it since Geneva?

Mr. FIELDS. I believe it was October.

Representative COLE. Since Geneva.

Mr. FIELDS. Since Geneva, yes, sir.

At this stage in the development of uses of atomic energy we believe it important that the Divisions of Reactor Development, Biology and Medicine, and Research administer the research and development effort necessary to advance the peaceful uses of atomic energy at home and abroad. Direction and coordination of their efforts are provided through the Assistant General Manager for Research and Industrial Development to whom they report.

As the committee is well aware, throughout our organization and our contractors' organizations many of the same programs, facilities and personnel contribute both to military programs and to peaceful applications programs. Any organizational moves must take fully into account this close interrelationship. The program of the Commission is going through a transitional period whereby increased emphasis is being and will continue to be devoted to the civilian and peaceful uses of atomic energy. Consequently, we recognize that our organization must be kept under very careful scrutiny to determine whether further changes will enable the Commission to function more effectively in the development of peaceful uses of atomic energy.

Chairman ANDERSON. At that point, General, you mentioned the Divisions you are going to have and the direction and coordination of their efforts are provided through the Assistant General Manager for Research and Industrial Development to whom they report.

I would assume that if a businessman came into Washington looking for information on industrial development, he would probably go to that division. Is that going to be 20 miles out in the country, or will you have a downtown office?

Mr. FIELDS. Present plans contemplate the location of the entire Commission at the Germantown site, sir.

Chairman ANDERSON. It would be fairly safe that you would not have many callers out there.

Mr. FIELDS. I am not sure. It is a very delightful neighborhood. It is a good site.

Chairman ANDERSON. Very well.

Mr. FIELDS. Recommendation 2:

That other departments and agencies of the executive branch be encouraged to develop their own organizations for dealing with their functional interests in peaceful uses of atomic energy, drawing upon the Commission for advice and services rather than leaning on the Commission or delegating their functions to it.

Other Government agencies are taking an increasing interest in the application of technical developments in atomic energy to their functional areas. These agencies include, particularly, the Departments of Agriculture, and Health, Education, and Welfare, and the Maritime Administration. We would anticipate that in view of the limited supply of technical manpower and to avoid duplication of effort other agencies will avoid establishment of parallel organizations. We believe that at the present time an effective working relationship has been established with all of the Federal agencies having an active interest in the peaceful uses of atomic energy.

Recommendations 3 and 4 of the panel on this topic are addressed to the Joint Committee and the Commission has no comment on them.

Chairman ANDERSON. Thank you very much. Unless there are questions, that will conclude this session of the examination of the panel report. Industry will be here on Monday, on the 5th. The meeting will be in this room. That will be at 10 o'clock in the morning. I would be happy, of course, if the members of the Commission could find it convenient to be here, because there may be questions that could be referred to their staff, just as you have had questions to refer to your staff.

Dr. LIBBY. We would be glad to come.

Chairman ANDERSON. There will be no hearing tomorrow because we did not need a third day. I desire to express my thanks to you, Dr. Libby, and the other members of the Commission, for your presentation of these points.

Dr. LIBBY. Thank you, sir.

Chairman ANDERSON. We will look forward at a later time to a discussion of section 8, which we passed over.

Dr. LIBBY. Yes, sir.

Chairman ANDERSON. And also to a discussion of patents which we hope will deserve some special consideration and the insurance matter that we will deal with in this seminar that we will have early in March.

Dr. LIBBY. Yes, sir. We will have all these in mind.

Chairman ANDERSON. Thank you very much.

(Thereupon at 2:55 p. m., Thursday, March 1, 1956, a recess was taken until Monday, March 5, 1956, at 10 a. m.)

DEVELOPMENT, GROWTH, AND STATE OF THE ATOMIC ENERGY INDUSTRY

MONDAY, MARCH 5, 1956

CONGRESS OF THE UNITED STATES,
JOINT COMMITTEE ON ATOMIC ENERGY,
Washington, D. C.

The Joint Committee met at 10 a. m., pursuant to adjournment, in the old Supreme Court Chamber of the Capitol, Senator Clinton P. Anderson (chairman of the Joint Committee) presiding.

Present: Senators Anderson (presiding), Pastore, and Bricker; and Representatives Holifield, Cole, and Patterson.

Chairman ANDERSON. The committee will be in order.

Mr. Jordan, we are very happy today to be able to start some hearings that will involve representatives of private industry and of various other phases of our economy to discuss this question of the panel's report on the impact of the peaceful uses of atomic energy.

Mr. Jordan, we are very glad to welcome you as the first witness.

STATEMENT OF HARRY E. JORDAN, SECRETARY OF THE AMERICAN WATER WORKS ASSOCIATION

Mr. JORDAN. My name is Harry E. Jordan. I am secretary of the American Water Works Association. With the support of its officers and directors, I wish to present to your committee certain opinions which we conceive to be in the public interest.

The association has a membership of more than 10,000 persons engaged in the design, construction, and/or management and operation of public water-supply works. We serve a hundred million town and city dwellers in the United States. Throughout the 75 years of our organized activity, we have had as our major concern, the health and safety of water users.

Our association maintains close contact with the health agencies in the various States and the United States Public Health Service at the national level.

The association was a participating agency in the engineers joint council, Nuclear Engineering and Science Congress, which was held in Cleveland, Ohio, during the month of December 1955. The chairman of this committee was a leading speaker at that occasion. We have also, during the period 1945 to 1955, inclusive, published in the Journal of the American Water Works Association a significant series of papers on problems based on studies of nuclear fission.

I personally have since 1950 been a member of the Technical Advisory Board for Research on Decontamination of Radioactive Waters,

which Board was jointly appointed by the United States Public Health Service and the Atomic Energy Commission. My participation in the activities of that Board has been directed toward the development of knowledge and practices assuring safety of the public—insofar as the waste products of the nuclear fission operations in the North American Continent may affect the water resources of the country.

As an individual I am distinctly not expert in the technical aspects of nuclear fission. But as an individual I am deeply concerned with the safety of the public—insofar as the public may be affected by the operations of atomic energy installations. Likewise, as an individual, but speaking for the association as a whole, I have been concerned with the difficulties which civilians have had and are continuing to have in exploring the possible peacetime applications of radiation. It is, therefore, with deep appreciation that I am able to refer to the recently released report of the panel on the impact of peaceful uses of atomic energy. Certain paragraphs from that report strike at the heart of the problem that I wish to discuss with you. They are as follows:

> We feel that a high priority must be set on means for bringing higher health standards to our people and the peoples of the world through the beneficial use of atomic energy in medicine and public health. As individuals learn to recognize these beneficial aspects, they will begin to lose their fears of atomic energy arising from the fact that hitherto their attention has been focused on its military applications.
>
> National security requires that some information related to atomic energy be controlled. The Commission, AEC, can take steps beyond those now contemplated, to improve the situation. The collation of all information pertinent to peaceful uses on some rapid and continuing basis is an important technique * * * Without action of this sort, important data seems doomed to pile up in obscure documents, and never reach those competent to use them.
>
> Therefore we recommend that the Joint Committee reexamine the concept that atomic information in all fields is "born" classified; we believe that this concept is not compatible with the expeditious action required to permit rapid development of peaceful uses of atomic energy; and that therefore this concept should be limited to the design, manufacture, or utilization of atomic weapons; and that the Joint Committee require the Commission to undertake the compilation of both classified and unclassified information relating to peaceful uses of atomic energy on a continuing and current basis so that it can be available in ready reference form for those entitled to use it.
>
> Continued expansion of basic research is, of course, essential to future progress.
>
> The Atomic Energy Act of 1954 encourages a Federal Government attitude favorable to the development and application of peaceful uses of atomic energy by private enterprise. These encouragements are conveyed as much by the general language of the 1954 act as by its specific provisions. The Commission is called upon "to strengthen free competition in private enterprise." Licensees seeking to conduct experimental work are to be subjected to the "minimum amount" of regulations. Services are to be made available to private industry in such a way as "will not discourage the development of sources of supply independent of the Commission." In other words, development of peaceful uses of atomic energy are to go forward in a climate favorable to private activity without jeopardy to the public safety or interest.
>
> Commission research policy on peaceful uses of atomic energy can encourage or discourage widespread participation.

For the waterworks industry I can support these expressions in the utmost sincerity.

We are all well aware of the great activity in the field of electric-power generation, looking toward the construction of atomic-power-generating plants. We are also aware, although not in so spectacular

a fashion, of the applications of radioisotopes in medical research and practice.

In the field where public health engineering is a day-to-day activity, waterworks, sewage works, environmental sanitation—the progress in the United States is less than satisfactory. Part of this may be due to the fact that public ownership and/or administration dominates these fields. A personal profit motive is secondary; the public interest is primary. I am particularly concerned with the lack of study and use of radioisotopes in solving practical problems in the water-supply field. Quoting again from the report of the panel on peaceful uses of atomic energy:

> Radioisotopes are also being used in actual industrial processes. The techniques employed are essentially the same as those which have been developed so successfully in medicine. Just as radioisotopes are used to trace the movement of blood in the human body. they are used to locate the dividing point between two different petroleum products flowing through overland pipelines. Tracer techniques in industrial research already in common use are exemplified by studies of engine piston wear which have already resulted in improved motor oils.

I have been unable to find in the United States waterworks field any comparable record of practical application of radioisotopes as tracers. Overseas the situation is different. There was published in the October 1955 issue of the British publication, Water and Water Engineering, a paper entitled "Application of Radioisotopes to Leakage and Hydraulic Problems." This paper reports the use of radioactive sodium as a tracer to detect leakage from newly laid water mains. The technique is simple. The evidence which it develops is precise. The material used, sodium 24, has a half life of 15 hours, so that the radioactive solution can be allowed to decay before discharge from the main. There is now in England a commercial firm engaged in the application of these techniques into routine civilian practice. They have no counterpart in the United States.

In a West German engineering publication Die Bautechnik (Construction Techniques) of September 1955 there appeared an article, recording the field application by a sewage works engineer, entitled "Radioactive Isotopes for Measuring Flows in Sewage Settling Tanks." Radioactive bromide was used in this instance. The author also refers to the application of these techniques in a study of the flow and detention time in an impounding reservoir for public water supply, for computing river flows, and for flow measurements of sewage sludge. The British studies incidentally have also included a study of the tidal ebb and flow of detritus in the Thames River estuary.

These examples of British and West German application of radioisotopes in solving civilian engineering problems are cited with deep regret that the engineers in the United States, who are internationally distinguished for the high level of the service rendered in the field of public water supply and sewage treatment, are behind their British and West German contemporaries in the application of radiation techniques which had their origin in the United States.

I shall not extend this discussion unnecessarily. Why is it that our engineers are behind those of other countries in this field? My opinion is that it is simply because of the fact that the Atomic Energy Commission has failed to a very serious degree to give encouragement to civilian studies of the application of radiation techniques.

Chairman ANDERSON. You think we are behind several other countries in this respect?

Mr. JORDAN. We are definitely by record behind Britain and behind West Germany.

Chairman ANDERSON. Have we made any studies here on the depositing of silt in reservoirs by radioactive materials; do you know?

Mr. JORDAN. I have no information that we have. We should be doing that.

Chairman ANDERSON. Is that not being done in other countries?

Mr. JORDAN. Yes. I checked with the Interior Department the other day and the man that I talked to had no knowledge of this particular operation, but I could have picked the wrong man.

In support of this opinion that I can cite, that this country needs encouragement in the use of radioisotopes. I cite the example of Dr. J. K. G. Silvey, chairman of the division of science in North Texas State College, who some weeks ago made application to the Atomic Energy Commission for cooperation in the research project involving the studies of Cobalt–60 for disinfection of drinking water. The very extensive series of studies that are now going on under the direction of the Quartermaster Corps of the Army, relating to the preservation of food in the use of radioactive materials, led Dr. Silvey to wish to undertake a study of the use of a comparable material in the destruction of bacteria which may be present in drinking water.

In reply to this request, Dr. Silvey received a letter over the signature of the Chief of the Biophysics Branch of the Division of Biology and Medicine of the AEC. The two paragraphs quoted herewith are of importance:

> As you may realize, the AEC in the past has received numerous proposals for investigations on the uses of radiation for sterilizing public water supplies. Because of limitations on research funds and the necessity for concentrating on problems of more immediate interest and concern, and also because of apparent practical limitations, on the application of radiation sources to such purposes, we have not felt justified in accepting these proposals or stimulating research in the field.
>
> It is apparent that quantities of radioactivity, many orders of magnitude greater than indicated, would be required to treat quantities of water associated with municipal supplies. This, together with the hazards involved in handling such large quantites and the economics involved, has naturally led up away from detailed investigations of the problem at this time.

These statements will indicate to your committee a "Papa knows best" attitude which should not characterize an important governmental agency. It appears quite unwise in these days of rapidly expanding knowledge of radiation techniques for a willing investigator to be so definitely discouraged from making a study which may have potentialities for good and which might on the other hand upon careful research be shown not to be useful. We are entitled to have either one or the other answer, upon the basis of controlled investigation, not upon opinion only.

Chairman ANDERSON. I just tried to send for a file on that because we have had our attention called to it in the committee a little bit also. Did they ask for anything extremely unusual in your opinion, if you knew what their request was?

Mr. JORDAN. Colbalt-60 has been used in similar investigations. I am not acquainted in detail with the nature of the investigations. They had to do with sewage treatment, I believe, certain oxidation

processes, and Colbalt-60 is known to have certain destructive effects upon microscopic life.

This man (Dr. Silvey) in this college felt that we should have an investigation of the possibility of using this material as a disinfectant for water.

I should deviate to this extent. I lack his enthusiasm for that particular investigation, but I think that he should be permitted to make it.

Representative COLE. If you lack his enthusiasm, why are you so caustic in your criticism of the Commission which likewise was undue?

Mr. JORDAN. Because the investigation should be made. We should not prejudge the answer before the investigation.

Chairman ANDERSON. It was my feeling that the Commission took a look at it and said, "We do not think it does any good, forget it," but here is an institution of fair size, and fine reputation, and a fine college; and they said, "We think it is worthwhile; and can we have the isotopes?" and the Commission said, "No."

Representative COLE. Was that the application of this Dr. Silvey, just for the isotopes?

Mr. JORDAN. Yes, sir.

Representative COLE. Or was it an application to set up a research under his jurisdiction at that university for the purpose of studying about this?

Mr. JORDAN. Exactly.

Representative COLE. So, it was something more than just isotopes, it was dollars that he wanted, to set up a project. I assume, and I do not know anything about it.

Mr. JORDAN. Naturally, he did not want the isotopes to just put on the shelf, and he wanted to make an investigation.

Representative COLE. Do you know what he did want?

Mr. JORDAN. I think that he wanted some money.

Chairman ANDERSON. He wanted a contract; there is no question about that.

Mr. JORDAN. I might point out at this moment, I did not touch on this in the prepared statement, but the Atomic Energy Commission is not the only avenue of funds available for study of matters of this sort. This is true at the present time—there are other sources of funds for that sort of study if the material can be had.

Now, if his application was a simple application for funds, a grant-in-aid, that is not what the letter said to him. The letter said that they did not think that this merited the study that he wanted to make. I disagree with that.

I, therefore, venture to suggest to your committee that whatever steps you take in putting into effect the report of the Panel on Peaceful Uses of Atomic Energy, you consider the establishment of a permanent interdepartmental panel to explore the possible areas of application of radiation techniques in the solution of civilian problems. On this interdepartmental panel, as I see it, could properly be representatives of the Department of the Interior, the Department of Agriculture, the Department of Commerce, and the Department of Health, Education, and Welfare. By titles, I would refer to the Director of Research as the representative of the Interior Department; the Director of the Business and Defense Services Administration of the Department of Commerce as the representative of that Department; and, the Research Coordinator of the Division of Sanitary Engineering

Services of the United States Public Health Service as the representative of the Department of Health, Education, and Welfare. A comparable individual in the Department of Agriculture would probably be the Assistant Secretary.

The activities of such a group would be the encouragement of laboratory or field studies of peacetime radiation techniques, and the conduct of such studies under rules appropriately agreed upon by the Atomic Energy Commission and the Cabinet Departments, to the end that public health and safety not be endangered; the military applications of nuclear fission not be unwisely disclosed; and, from a positive standpoint, the application of atomic energy to civilian activities be promoted as energetically as possible. I think your committee will agree with me that the time is quite right for a resetting of our national sights in this area of action.

The American Water Works Association cooperates with the Federation of Sewage and Industrial Wastes Associations, the Conference of State Sanitary Engineers, and the Water & Sewage Works Manufacturers Association, in the activities of a joint policy committee.

It is the opinion of this joint committee that with the widening application of reactor practices in the hands of licensed civilians the problem of safety control widens at accelerated rates. We, therefore, conclude that the protection of public health and safety, outside the installations of the Atomic Energy Commission itself, need to be definitely assigned to lifetime specialists in public health administration—either at the Federal, State, or local level. This joint opinion is expressed in the following resolution:

Whereas the expanding development of nuclear energy and nuclear materials including their commercial and industrial utilization, as authorized by the United States Atomic Energy Act of 1954 will involve major problems in the control of waste materials so as to prevent significant health hazards from the planned disposal or accidental release of contaminants to the environment; and

Whereas it is particularly important that water pollution or other impairment of surface or ground water resources be prevented; and

Whereas State and local health departments and other agencies in the several States and the United States Public Health Service have legally delegated responsibilities for protection of the health and safety of the public, including supervision over the control and disposal of industrial and other wate materials, which responsibilities must be recognized; and

Whereas for many years State and local health departments, the United States Public Health Service, and other agencies have studied the problems of water pollution, and have developed technical and administrative procedures for the control of waste materials and other environmental contaminants, and, in many States, for supervision over the development and use of water resources: Therefore be it

Resolved, That the organizations below listed recommend that, in further modifications of the Atomic Energy Act, (1) the inherent responsibilities of the States and of the United States Public Health Service in their respective jurisdictions for the protection of health and for supervision and control of the disposal of radioactive wastes and protection of water resources should be specifically recognized in this act, and (2) the Atomic Energy Commission should be clearly authorized to encourage and assist State health departments and other responsible agencies, by training and other means, to develop their knowledge and competency and to assume responsibility for health and safety aspects of nuclear energy operations.

This resolution has been officially approved by the joint policy committee of American Water Works Association, Federation of Sewage & Industrial Wastes Association, Water & Sewage Works Manufacturers Association, Conference of State Sanitary Engineers.

We venture the opinion that your committee will not object to our making certain definite suggestions concerning the text of the amendments we support.

We also suggest that there be added to chapter 10, following sections 103 and 104, the following new section:

Every licensee under this act who holds a license from the Commission for the commercial or industrial utilization of nuclear material, medical therapy, or research and development shall be subject to the supervision and regulations of any State public health department and/or water pollution control agency having jurisdiction of the United States Public Health Service under terms of Public Law 845 or its successor act, with respect to the control and disposal of waste materials.

The addition of the above may lead your committee to clarify the present language in sections 103 (b) and 104 (b) and (c). We have also noted the phraseology of sections 271 and 272 of the 1954 act. They read as follows:

SEC. 271. AGENCY JURISDICTION

Nothing in this act shall be construed to affect the authority or regulations of any Federal, State, or local agency with respect to the generation, sale, or transmission of electric power.

SEC. 272. APPLICABILITY OF FEDERAL POWER ACT

Every licensee under this act who holds a license from the Commission for a utilization or production facility for the generation of commercial electric energy under section 103 and who transmits such electric energy in interstate commerce or sells it at wholesale in interstate commerce shall be subject to the regulatory provisions of the Federal Power Act.

We suggest the following new section to follow section 271:

SEC. ——. AGENCY JURISDICTION

Nothing in this act shall be construed to affect the authority or regulations of any Federal, State, or local agency with respect to control of environmental health hazards or the protection of water resources.

We have also noted that while the Western States have for a long period had on the statute books laws governing the appropriation and use of water, many of the 1955 State legislatures in the East are considering the enactment of similar legislation. There are today very few places in the United States where a development of an industrial plant involving use of such large quantities of water can be accomplished except through permit from a State agency which controls the allocation and use of water. Since licensed nuclear reactors are of necessity large users of water, the following addition to follow section 271 in the amended act is suggested:

SEC. —— WATER RIGHTS. Nothing in this act shall be construed to affect the authority or regulations of any State agency or the validity of any State legislation governing the rights to, the development of, or the use of water resources.

In conclusion, I wish to quote again from the report of the Panel on the Peaceful Uses of Atomic Energy:

During the present transition from all-Government to Government and private responsibility for the conduct of applied research and development relating to the peaceful uses of atomic energy, a more equitable sharing of the burden should be the constant objective of the Commission and of industry.

For industry, the general public, to bear its responsibility, it must have facilities, personnel, current and full information, and detailed knowledge of Commission programs as they relate to peaceful uses. Normal competitive incentives must be available. To hasten progress a two-way flow of information between the Commission and industry is essential.

I have pointed out to you the present deficiency in the application of radiation techniques in the field of water supply and sanitation and suggested certain steps to correct the situation.

I have also suggested certain amendments to the 1954 act which will widen the area of responsibility of public-health agencies as civilian uses of radiation materials are ordered.

I appreciate your courtesy and bespeak your affirmative consideration of the above suggestions.

I am restating here material which I filed with this committee last year, relating to certain modifications of the Atomic Energy Act of 1954, and recommending the placing of certain responsibilities for the public-health protection upon the public-health services at the national level, and the State departments of health at the State levels, rather than leaving the entire authority in the hands of the Commission as it now rests.

This is transmitted to you in the form of a resolution from the American Water Works Association, the Federation of Sewage & Industrial Wastes Association, and the Conference of State Sanitary Engineers, and the American Water Works Manufacturers Association.

I think this element has a distinct bearing upon the widening area of applications of radiation material in the field.

Representative PATTERSON. I just want to say, to the extent that I cannot agree with the entire statement, just from my experiences in traveling abroad, I do not think that by any stretch of the imagination any of those European countries are ahead of us or superior to us in our sewage system or in our reservoir systems. I know from experience, in going to the various countries, you are always warned about drinking water.

Mr. JORDAN. I did not say that, Mr. Patterson. I said this country is ahead of those countries in the regular applications of water supply treatment and sewage treatment. We are doing a better job than they are. But we are behind them in the application of these radiation techniques to studies of problems where we do not have the answer yet. Do not ever let me be quoted as damning the American waterworks industry. I would and should lose my position.

Representative PATTERSON. That will clear the record.

Chairman ANDERSON. Thank you, Mr. Jordan. Are there any questions?

All right, Mr. Van Eman.

STATEMENT OF K. W. VAN EMAN, VICE PRESIDENT AND MARINE MANAGER OF THE SKINNER ENGINE CO., ERIE, PA.

Mr. VAN EMAN. Mr. Chairman and gentlemen of the committee, my name is K. W. Van Eman, vice president and marine manager of the Skinner Engine Co., Erie Pa. At this time I would like to divert a little from the text to make a general statement to the effect that I appear here as a representative of small business in America and specifically as a representative of the Skinner Engine Co. because that is the company with which I am most familiar and with which I have spent almost my entire working life.

Representative COLE. On the question of your representing small business, Mr. Van Eman, are you truly, or do you represent any group of small-business men?

Mr. VAN EMAN. Sir, I am not an official representative of any small-business organization. My remarks are in the interest of small business.

Representative COLE. You yourself are representative of small business?

Mr. VAN EMAN. Yes, we are a small-business enterprise.

Representative COLE. All right.

Mr. VAN EMAN. The Skinner Engine Co. is a national organization, builders of power equipment serving industry, government, such institutions as hospitals and universities, War Department, Quartermaster Corps, Navy Department, Maritime Administration, and other Government agencies, State and municipal governments, and in the maritime fields, both domestic and foreign, including our outlets in Holland, France, and Canada, as well as the marine field in all 48 States during the past 88 years.

Skinner Engine Co. are builders of the world's largest marine uniflow steam engines serving the United States Navy, United States Army, and the American maritime industry. It also builds the largest stationary uniflow steam engines in this country.

Evidence describing these various types of steam engines will be found in exhibit A. Exhibit B covers certain reprints of our advertisements showing the wide variety of types of ships now being propelled with Skinner marine uniflow steam engines.

I appreciate the opportunity afforded me by this committee to appear before you today to tell of the effect and impending effects the field of atomic energy will have on the American merchant marine and small-business plants like Skinner Engine Co., which serves that industry and to request your consideration and assistance on some of the difficult problems facing us for our future survival in the maritime and industrial powerplant fields.

I appear before you, having 30 years' service in various power and power propulsion fields, having made considerable studies for the past 4 years on the application of atomic energy and its present impact and future effect on American shipping, both domestic and deep water, and as a representative of the Skinner Engine Co.—a company which since its inception has served American industry.

The American merchant marine is comprised of approximately 38,000 vessels having an approximate tonnage of 30,500,000. These figures represent vessels of all types and approximately 34,000 are under 1,000 tons. About 88 percent are inland water and small coastal vessels, approximately 3,775 or 11 percent are vessels from 1,000 to 10,000 tons, approximately 369 or 1 percent are vessels over 10,000 tons.

About 64 percent of the total number of our vessels have been built since 1930. Many of these vessels have severe limitations in speed and are semiobsolete. The bulk of these have been used for war purposes and have passed the 70 percent work of life expectancy for ships. Approximately 2,110 vessels of deepwater class, representing over 13 million tons, are in our laid-up fleets. Therefore, the

vast bulk of merchant vessels is overaged and a large portion is inactive.

With the development of atomic energy, and the vast program that our Congress has delegated to the Atomic Energy Commission, which will affect every line of industry in a few years and with the prospects of our first atomic surface vessel beyond the drafting-board stage, we in the powerplant business realize that—

1. The arrival of nuclear power is making obsolete not a minor industry but a very large industry in the United States today.

2. The use of nuclear power will mean the rebuilding of our merchant fleet due to technological changes, age, and obsolescence.

3. Small business in the maritime and powerplant industry will "die on the vine" because of lack of help and assistance to realine our programs for atomic powerplants and join in the progress parade of the atomic field. This is sad to note, especially when small plants like Skinner Engine Co. were the very foundation of the present American industrial empire, which supplied the free world during the last World War and today holds the promise of freedom for all mankind.

From previous reports to your committee, we were delighted to learn that your committee is particularly interested in hearing from people who are not involved in the atomic power field as such from its technological aspects, and who, therefore, can take a fresh look at the issues and come up with some new ideas. This is precisely our position. We are, however, definitely involved as a small-business enterprise which finds itself on the threshold of great technological advance and without the assistance and encouragement to take advantage of it.

In other words, as we see it, we are in the living or dying area so to speak, and will perish unless the doors are opened for us.

In the preliminary July report to your committee of the plan for the study by the panel on the impact of peaceful uses of atomic energy, it is stated on page 4 that authorities agree that the propulsion and transportation equipment field is the second most important area in which the imminence and significance of developments of peacetime atomic energy justifies study and technological projections.

I respectfully refer to the report of the panel on the impact of the peaceful uses of atomic energy, volume No. 1, chapter 7, Atomic Propulsion, and I quote:

> There is at present no Government program directed specifically to the development of atomic engines for commercial ships.

I have been informed that the Maritime Administration has requested 23 firms to submit by March 16, 1956, proposals for the design of an atomic-powered oil tanker for completion by mid-1959.

With further reference to volume 1, chapter 7, in the report of the panel on the impact of the peaceful uses of atomic energy, I quote:

> Thus, we can see a possibility that commercial shipping using atomic power could create sizable demands for the construction of atomic marine engines and for production and processing of nuclear fuels.

And with further reference to volume 1 under Conclusions and Recommendation, Propulsion of Commercial Ships, I quote:

> Advantages of such ships during any future war, as well as maintenance of United States maritime prestige, give a degree of urgency to this line of development.

However, nowhere in volume 1 and 2 do I find any specific recommendations to the integration of, the engaging of, or extended aid or financial assistance to prominent small-business plants such as the Skinner Engine Co.

The Skinner Engine Co., founded in 1868, has had a long and successful career over a period of 88 years building exclusively steam reciprocating machinery. In the short period of the decade preceding 1952, 1,252,000 horsepower in marine engines alone were produced.

This company manufactures what is known as the Skinner marine unaflow steam engine. During World War II, these engines were installed as main propulsion units in various types of vessels for the armed services. These included CVE aircraft carriers, landing ship docks, mine planters, ocean-going tugs, and cable ships.

The Skinner Engine Co. is a small-business enterprise that has served our Nation both in war and peace. Its outstanding service to the Nation was officially recognized on December 8, 1941, less than 24 hours after the attack on Pearl Harbor, when the War Department presented its first high-production flag to the Skinner Engine Co. together with the famous gold standard of the Army Transportation Corps.

At the close of World War II, the successful operation of Skinner engines in the armed services received worldwide recognition. Canadian Vickers Limited of Montreal were the first of several leading shipbuilders throughout the world to request a licensing and building arrangement. As a result, Vickers of Canada have equipped a large number of vessels built in their own and other Canadian yards, with these engines for various classes of service, such as passenger ships, ore carriers, colliers, ferryboats, tankers, and icebreakers.

This engine is particularly adapted for icebreaking service and the Canadian Government has standardized on Skinner engines for its icebreakers, having already built a fleet of 5 with 1 presently under construction. The largest of these is the S. S. *d'Iberville*, which is reputed to be the most effective vessel of its kind on the North American continent.

In Holland, Skinner engines are manufactured under license by Amsterdamsche Droogdok-Maatschappij N. V. of Amsterdam, Netherlands, and in France, by Ateliers et Chantiers de la Seine Maritime, Paris, France.

Our licensees abroad naturally depend upon us for technical assistance and know-how in the manufacture of our engines. We and they realize that Skinner engines, as now built, are applicable as the power unit for propulsion with a nuclear reactor. Particularly Canadian Vickers are definitely interested in our development of a reactor program using these engines and from time to time are questioning us with regard to our future plans, and our interest in the atomic field.

To further inform you regarding the importance of the Skinner Engine Co.'s position in the marine field, we are listing the names of a few American and Canadian companies which have installed our engines in their vessels; these names will be recognized as household words in America: Bethlehem Steel Corp., The Texas Co., Standard Oil Co. of New Jersey, Gulf Oil Corp., Pennsylvania Railroad Co., C. & O. Railway, Santa Fe Railroad Co., Pikands Mather, Boland and Cornelius, Canada Steamship Lines, Canadian National Railways, and Imperial Oil Company of Canada.

The Maritime Administration has made a study of a large number of reactors presenting the best promise for the best vessel operation. The Maritime Administration is of the opinion that the nuclear power is developing at a rapid pace and their officers of ship construction and repair consider it essential to evaluate the applications of nuclear power for a merchant fleet program. The results of engineering evaluations and studies indicate that nuclear energy for merchant ships application is technically feasible and it is safe to construct and operate merchant ships with nuclear reactors with present known technologies.

A final consideration is the fact that our merchant marine is now approaching block obsolescence. Any new type of equipment which has not been developed and proven to some extent within the next 5 or 6 years will not be introduced into our next generation of ships, which will only have a 20-year life period. Therefore, it becomes even more important that emphasis and initiative be given to the development of a commercial marine type nuclear reactor propulsion plant and the development of ships of selected types and of the proper design.

This small-business enterprise, the Skinner Engine Co., has had a long, successful record of designing, building, and installing marine engines in almost every class of ships from merchant vessels to tugs and including ore carriers, small passenger vessels, car ferries, and tankers. With encouragement and assistance, we believe that we can undertake and successfully conclude the development of a reactor which can be applied to a substantial part of the category of vessels with which we are familiar. Such a program would be in accordance with the thinking of our Defense Department, the policy of which is to decentralize as much as possible the manufacture of equipment used by our various defense agencies.

One of the marine fields in which we the Skinner Engine Co. have had considerable experience, namely the inland waterways, with particular emphasis on the Great Lakes and the Mississippi and Ohio Rivers, there appears to be an immediate need for the development of a reactor of modest proportions.

In time of a national emergency, it is quite apparent that our steel industry will have to depend on its ore supply from sources within the confines of the North American continent. See the editorial, September 1949, Marine News. This means a dependence on the Mesabi and upper Michigan deposits, and the Labrador developments after the opening of the St. Lawrence seaway.

On the 286 ore carriers under American registry engaged in the Great Lakes trade, 48 are over 50 years of age, 112 between 45 and 50 years of age, 32 are from 40 to 45 years of age, 15 from 35 to 40 years of age, leaving only 79 under 35 years of age.

This indicates a large replacement program should be undertaken, as the situation as it now exists is a national menace. However, we understand that this segment of the maritime industryl has requested a replacement program from the Federal Government in the interest of national defense.

Ninety-nine percent of these vessels engaged in the ore trade are steam propelled and this type of propulsion lends itself admirably to the use of an atomic reactor. It is unthinkable in this modern age

that this large new construction program should be undertaken without full consideration being given to atomic propulsion.

Transportation on our great rivers, particularly the Ohio and Mississippi, has been growing by leaps and bounds, particularly since World War II. Although larger and more powerful towboats have recently been placed in operation, there is a limitation on the power and size of these because of the type of equipment presently available. It is quite possible that this limitation could be removed by the design of a successful reactor.

A statement by Capt. Carl J. Lamb, of New Orleans, La., a naval architect and recognized authority on inland waterways' transportation was made as follows:

> When we consider the possibility of nuclear propulsion of river towboats, we are considering propulsion by steam machinery, using a nuclear reactor to generate steam, which will operate uniflow engines, geared turbines or turbine-electric-driven motors.

Presently there is a serious and dangerous shortage of atomic scientists and trained technicians in the atomic field. Low wages for the Government employee in this field is obvious when compared to the money these man can command in the industrial atomic field.

The Federal Government should encourage the educational institutions in the several States to adopt in their curricula, studies covering the atomic field. With particular emphasis on the secondary school, the students' interest should be developed in nuclear subjects. In this manner we will start building a necessary reservoir of knowledge in this fast developing industry.

It is my considered opinion, since it is generally agreed that ship propulsion and transportation is the second most important nuclear field, that the establishment of a marine division in the Atomic Commission itself is essential in order that the Maritime Administration and the Atomic Eneergy Commission can coordinate their activites in the developing of atomic powered vessels for merchant marine.

Since the Maritime Administration is completing the plans for our first atomic-powered vessel and since the Congress is considering the appropriation of necessary funds for its construction, we must conclude that atomic-powered commercial vessels are here for this Nation. This is only proper because nuclear power was first developed in this country and we should and must lead the world in the building of an atomic merchant fleet.

We must regain the prestige that this Nation enjoyed in its clipper ship days. We must set the pattern on atomic-powered vessels for the rest of the world to follow. We must be the leaders in that field which gave birth to the commercial and industrial life on this continent.

Industry, large and small, must respond to the American atomic developments. They must be induced and enticed to push the program by taking an active part, and I refer specifically to small-business plants like the Skinner Engine Co. However, when it is a matter of record that the Government has no specific program for the building of an atomic marine plant for commercial surface vessels and they are drawing plans for the vessel itself and others to follow, some immediate action should be taken.

It has been the custom and accepted practice in the maritime industry since its inception, to engage in prototype development. Here-

in lies the key to small-business participation in the field of atomic development along commercial lines.

Since we have a plant with engineering and production facilities, and since we have served industry and Government agencies and the marine field, both domestic and foreign, we respectfully request this honorable committee to give consideration to small business, such as ours, with proven ability and background, to engage in a maritime atomic development with the prototype plant, consisting of an atomic reactor with a marine engine.

In this manner small business will develop a greater interest for participation in peaceful uses of atomic energy. This would serve as a breakthrough for small business in the atomic field.

Gentlemen, at this time I would like to add a statement here. I would like to submit to you this statement in part that was reported in the New York Times yesterday, March 4, in a feature article which in my opinion is extremely important at this time. The title is, "Soviet Is Pushing Atom Power Plan." It is as follows:

The scope and nature of Soviet plans to capture world leadership in the programs of peaceful use of atomic energy were indicated at the recent Communist Party Congress in Moscow.

This was done by the man regarded in the West as the scientific commander of the Soviet nuclear weapons effort, Academician Igor V. Kurchatov.

The implication of the Soviet scientist's statement appears to be that the Soviet Government is deliberately building a wide variety of atomic power stations, even though many will be uneconomic, in an attempt to solve the problem of economical power generation from the atom.

In addition, Mr. Kurchatov said, an atomic-powered icebreaker is scheduled to be built before 1960, designed so that it would have to be refueled only once every 2 or 3 years.

He indicated that Soviet atomic development had gone so far that it was was appropriate for the initiative in planning new uses of atomic power in planes, ships, and other forms of transport to be shifted to engineers in those industries from the personnel of the atomic industry itself.

Thank you, gentlemen.

Chairman ANDERSON. I notice you used only a small part of that article. I had clipped it out of my copy of the paper yesterday, and I intended to make some use of it. But you left out the part that I thought was quite interesting, where it says:

Soviet plans to build by 1960 atomic electric stations with a capacity of 2,000,000 to 2,500,000 kilowatts, comprise a great experiment carried out by the government to find the most reliable and economic technical means for creating atomic power stations.

Did you not regard that of some importance?

Mr. VAN EMAN. Yes, because they are going to spend the money irrespective of the cost to find out the economics. But the part I was particularly interested in, Senator, was the statement they were going to build an icebreaker, and of course we all know that.

Chairman ANDERSON. I realize you being in the maritime engine business, that would interest you because that is an immediate application. But I was a little interested in the fact that here again was an announcement that—

Soviet scientists asserted that this year would see the completion of the world's most powerful nuclear particle accelerator, the Soviet 10-billion-electron-volt accelerator having an electric magnet weighing 36,000 metric tons.

Do you think we have anything like that in the United States?

Mr. VAN EMAN. We have not, as I understand it.

Chairman ANDERSON. Well, you understand it correctly, I think.

We hope now to start building one if we can resolve some difficulties we have had.

Mr. VAN EMAN. The point I think that is brought out in this Times article is that they are going ahead to spend the money to find out the answers irrespective of the cost.

Chairman ANDERSON. I referred the other day to the experiments in Great Britain where two experimental powerplants are now being constructed by the Atomic Energy Authority, Calder Hall, and Dunray. It pointed out in our panel report that on February 15, 1955, the British Government issued a white paper outlining the provisional program for atomic power development over the next 10 years. To me, the somewhat important part was that the first unit of the Calder Hall reactor has gone into operation, and the next unit will go into operation in a short time, and they will have, I think, a 90,000-kilowatt plant in operation next year.

Have you had information of a plant that size in the United States going into operation next year?

Mr. VAN EMAN. No, sir, I have not.

Chairman ANDERSON. Of course, the statement was made that plutonium was involved in the manfacture there and that might have something to do with weapons, but the British announced that that plutonium might be useful in other reactors. Could it be possible they are going to use this peacefully as well as for war purposes?

Mr. VAN EMAN. I do not think so, sir.

Representative COLE. You do not think what?

Mr. VAN EMAN. I think the Russians are more interested in atomic energy for war purposes.

Chairman ANDERSON. I question whether that is the end of the British experiment. I do not believe it is and I do not believe the British believe it is. I think they feel, because of their lack of many resources, that they can use plutonium in their reactors more advantageously than they may be able to use it for war purposes. But the fact remains that they will have a large unit in a short time. We do not want to get behind in that sort of a race.

Are you not, however, satisfied that we will make some headway by this contract which the Maritime Administration has asked for?

Mr. VAN EMAN. Yes, sir.

Chairman ANDERSON. Do you think there ought to be more, particularly of a smaller size?

Mr. VAN EMAN. I think of a smaller size, and I think that a prototype plant should be started.

Chairman ANDERSON. Are you familiar with the fact that the military has plans for a small powerplant somewhat portable, perhaps, running 5,000 to 10,000 kilowatts?

Mr. VAN EMAN. I understand that they have.

Chairman ANDERSON. Do you think something similar to that in the Maritime field would be desirable?

Mr. VAN EMAN. I think so, yes, sir.

Chairman ANDERSON. Are there any questions?

Representative PATTERSON. I just want to say to the gentleman that I was glad to see that he has shown a great interest in our Maritime Service, because I think that at the present time it is at a rather low ebb. The trade future of our country is greatly dependent upon a

strong fleet. Especially is that true, if we should ever get into another conflict, a global conflict, certainly we would be wholly dependent then upon an up-to-date and adequate Maritime Service.

Mr. VAN EMAN. Yes, sir.

Representative PATTERSON. I think that Skinner is to be complimented in their interest in that particular field.

Mr. VAN EMAN. Thank you.

Chairman ANDERSON. Are you 1 of these 23 first that you referred to here?

Mr. VAN EMAN. No, sir; we are not shipbuilders.

Chairman ANDERSON. Do you have any connection with any of the 23 firms?

Mr. VAN EMAN. No, sir; we build the machinery that goes into the ships, and it is the design of the hull that I have reference to there.

Chairman ANDERSON. At the time you went through that, I was not quite clear about your statement there. Let me see if we can find what you are objecting to. You say on page 4 now:

> I respectfully refer to the report of the panel on the impact of peaceful uses and I quote: "There is at present no Government program directed specifically to the development of atomic engines for commercial ships."

Then you say:

> I have been informed that the Maritime Administration has requested 23 firms to submit by March 16, 1956, proposals for the design of an atomic-powered oil tanker for completion by mid-1959.

Now, you are not just referring to the design of the hull in that?

Mr. VAN EMAN. I am referring to the fact that whereas they have requested firms to submit proposals for an atomic-powered oil tanker, they have done nothing about asking for a proposal on the atomic power that goes in it.

Chairman ANDERSON. Well, this oil tanker is not just going to float; it is going to be powered, is it not?

Mr. VAN EMAN. That is correct, but they have not gone into the power yet.

Chairman ANDERSON. That is what I am trying to get to, that is what you object to, that they have not gone into the question of power?

Mr. VAN EMAN. Yes, sir; that is correct.

Chairman ANDERSON. By reading it, I could not tell you.

Mr. VAN EMAN. It is somewhat ambiguous, but that is exactly what I mean.

Chairman ANDERSON. Well, you think that there ought to be a Government program directed to the specific aspects of the development of atomic engines for commercial ships?

Mr. VAN EMAN. Yes, sir.

Chairman ANDERSON. You do not think that that program now exists?

Mr. VAN EMAN. It does not; I do not believe it exists, sir.

Chairman ANDERSON. I agree with you, and I do not think it exists, but it might exist, and I do not know what is covered by the Maritime Commission's proposal. Surely they are going to build a whole ship, are they not?

Mr. VAN EMAN. They are going to build a ship but as yet have not come up with any idea as for prototype plants to power the ship.

Chairman ANDERSON. Have they not asked for plans for the power units?

Mr. VAN EMAN. Not to my knowledge; no, sir.

Chairman ANDERSON. Well, at least if they have, you have not heard about it?

Mr. VAN EMAN. That is correct, sir.

Chairman ANDERSON. And if plans are there, to do it, you think someone of the stature of your firm and, not trying to pass on whether your firm is good or bad or large or small, but I think someone of the size of your firm ought to have heard about it?

Mr. VAN EMAN. Yes, sir.

Chairman ANDERSON. We had better find out from the Maritime Commission about it. I understood they had asked for the powerplant to be designed inside this ship.

Mr. VAN EMAN. I did not so understand.

Representative COLE. That was their proposal.

Chairman ANDERSON. It is my understanding that they have given out tanker designs and requested proposals for a basic nuclear powerplant in the first unit which will come out in 1959. Subsequently they may ask for proposals on the design of a more advanced nuclear plant.

Mr. VAN EMAN. But they have not definitely designed it yet.

Chairman ANDERSON. They might just as well be asking for that now, that is your contention?

Mr. VAN EMAN. Yes, sir.

Now, is it time to get into it, because we do not want to be behind the parade?

Chairman ANDERSON. We do not want to do that, I agree with you on that.

Thank you very much.

Mr. VAN EMAN. Thank you, gentlemen.

(Following is the circular letter sent out by the Maritime Administration to selected private firms, soliciting proposals for manufacture of a nuclear propulsion system for a merchant ship:)

DEPARTMENT OF COMMERCE,
MARITIME ADMINISTRATION,
Washington 25, D. C.

GENTLEMEN: The Maritime Administration is exploring the possibility of the installation of a nuclear powerplant as a propulsion unit for a merchant vessel. Preliminary studies have indicated the promise of this type of propulsion as applied to merchant ships, and it is desired to obtain complete information covering the technical and economic feasibilities and time tables of engineering development and construction required for the installation of a nuclear power plan in a merchant ship.

Your company may have an interest in conducting engineering and economic studies of this nature, and this letter is accordingly being transmitted to you. It is our intent that industry afford us the benefit of their background and experience in developing a commercial marine-type reactor and its associated equipment.

You are invited to submit a fixed price to do all work necessary to select, design, manufacture, deliver, and to provide supervision for the installation and sea trials after shipboard installation of a nuclear propulsion system which you recommend for merchant marine application. It is requested that this price be broken down to indicate the cost of the major components.

Your recommended system shall be capable of being developed and installed in a tanker to be in operation by June 30, 1959, and should be a system which approaches the ultimate goal of producing a nuclear propelled tanker which is commercially competitive. Enclosure No. 1 describes the general requirements of the nuclelar propulsion system to be studied with respect to purpose, scope, design criteria, economic considerations, schedules, and budgets for engineering

studies, development, and manufacture. Enclosure No. 2 describes the conditions for submission and evaluation of proposals.

You are further invited to submit an estimate of costs to conduct preliminary studies of a nuclear propulsion system which may offer greater ultimate technical and economic advantages than one which you are prepared to place in operation by June 30, 1959. The most promising study proposals received will serve as the basis for negotiation of study contracts. It is planned that at least one of the study contracts will deal with a nuclear propulsion system incorporating a closed-cycle gas turbine. Preliminary studies conducted on these more advanced systems are expected to be completed on, or about, August 15, 1956, following which it is planned to let contracts for development and manufacture of a nuclear propulsion system, contingent upon securing necessary congressional appropriations. The objective of this phase is to have a merchant ship in operation by June 1961.

Enclosures No. 1 and 2 apply generally to the submission of estimates for studies of an advanced nuclear propulsion system as well as to the submission of fixed prices for manufacture as described above. Proposals may be submitted for either the propulsion system to be completed by June 30, 1959, or for preliminary studies of more advanced designs, or for both.

Proposals should be sent to the following address prior to January 16, 1956.

Office of Ship Construction and Repair,
Maritime Administration,
United States Department of Commerce,
Washington 25, D. C.
Attention: Code 810

Sincerely yours,

J. J. McMULLEN,
Chief, Office of Ship Construction and Repair.

Chairman ANDERSON. The next witness is Mr. Steiger, of the National Association of Manufacturers.

STATEMENT OF WILLIAM A. STEIGER, VICE CHAIRMAN OF THE COMMITTEE ON PATENTS OF THE NATIONAL ASSOCIATION OF MANUFACTURERS

Mr. STEIGER. My name is William A. Steiger. I am vice chairman of the committee on patents of the National Association of Manufacturers, chairman of that committee's subcommittee on atomic energy, and I am speaking today for that association.

During the last 3 years, our association has followed with great interest the work of this committee which resulted in passage of the Atomic Energy Act of 1954. We have now reviewed the report of the panel on the impact of the peaceful uses of atomic energy, generally referred to as the McKinney report, and our association wishes to make some comments at this time with respect to patents.

As you know, the panel concluded that a general review of the patent provisions of the 1954 act be set aside until September 1, 1959, is closer at hand. This is the date referred to in the provision for compulsory licensing. In other words, while the panel points out the great value of the patent incentive for advancing this art, it proposes that we carry on for another 3½ years with patent laws which are confusing and which are not in the best interest of advancing this art.

In its conclusions and recommendations, the panel urges—

prompt and definitive statements of Commission patent policy are currently more essential than revision of the patent provisions of the 1954 act.

We believe this is unfair to the Commission, as the Commission must, of necessity, act strictly in accordance with the law and be cautious

in its interpretations of the law. We believe that the panel "has the cart before the horse" and that the first thing that should be done is to amend the law, after which we are confident that the Commission will be in a position to draft sound regulations.

Chairman ANDERSON. Do I understand that you believe here that they cannot give any definitive statements of patent policy under the present law?

Mr. STEIGER. They are under a tremendous handicap.

Chairman ANDERSON. Do you think that they cannot do it under the present provisions of the law?

Mr. STEIGER. Yes, they lack latitude under the present law. I will come to that a little later, Senator.

Such regulations should be so drawn as to develop a patent position for the United States both in this country and abroad commensurate with this country's inventive contributions, whether Government financed or privately financed. In testifying before your committee on previous occasions, I gained the impression that its members realized that the patent provisions of the present act required revision and I sincerely hope that the recommendations of the panel will not deter your committee from taking action at this time.

Since I had the privilege of appearing before your committee on February 10, 1955, many of the uncertainties pertaining to this new enterprise have been resolved or clarified.

Referring now to specific recommendations for changes in the patent provisions, it is our recommendation that section 152 of the present act be deleted in its entirety. This is one of the sections which is creating confusion in industry. The wording of this section is so broad that it actually vests in the Commission any invention or discovery that any private inventor might make or conceive as long as there is some "arrangement or other relationship." However, in many contracts which the Commission now holds or will enter into with various contractors and subcontractors, there is unquestionably an arrangement or relationship with the Commission. In such cases, the present law will prevent the Commission from issuing regulations which are in the best interest of this country.

Senator BRICKER. Provided it is needed, and taking your statement as a premise, would it not be your judgment that the Congress should definitely state what the conditions are rather than leaving it up to the arbitrary judgment on the part of the Commission, which is an administrative board?

Mr. STEIGER. Yes, sir. My point is, Senator, that under the present law the hands of the Commission are tied because——

Senator BRICKER. You want the hands of the Commission untied, or do you want the Congress to say definitely what conditions the patents will be issued under?

Mr. STEIGER. I want the hands of the Commission untied, and then the Commission to issue regulations which will be satisfactory to the Congress.

Senator BRICKER. Would it not be the duty of the Congress to lay down those conditions rather than the Commission?

Mr. STEIGER. I think it can be better done, Senator, in the Commission.

Senator BRICKER. Why?

Mr. STEIGER. I think the Commission is closer to this thing, and there are so many different types of contracts it is entering into, and it has to have latitude, because there are many, many different types of contracts. Each one involves a different equity situation.

Senator BRICKER. But there is no difference in principle.

Mr. STEIGER. No difference in principle, no.

Senator BRICKER. One thing I am disturbed about is the great amount of power that the Congress has seen fit throughout the years to give to these various boards and commissions, and if there is a fixed principle involving the Commission Congress ought to say so and not leave it to the discretion of the board to apply it there and perhaps qualify it there.

Mr. STEIGER. My idea is that when the Commission has prepared the new regulations, they would not go into effect without the approval of this committee.

Senator BRICKER. Of course, they have to be filed with the committee, but there would be no positive action taken by this committee.

Mr. STEIGER. No.

Senator BRICKER. That is, under the present law.

Mr. STEIGER. If section 152 is eliminated, the Commission will then have the necessary latitude to issue regulations which are sufficiently flexible to establish procedures which are in the best interest of all concerned without fear of violating the law.

As you know, the Government presently has the following four types of arrangements or other relationships with private industry:

Type 1. Research and development contracts for Government-owned and Government-financed facilities;

Type 2. Research and development contracts financed by the Government but utilizing privately owned facilities.

Type 3. Supply contracts for the purchase of materials which contracts involve no research or engineering effort; and

Type 4. Access permits to private contractors making available to the latter certain technical information in possession of the Commission.

In each of the first three types of relationships, the Commission uniformly reserves the right to acquire ownership in the invention and patents of the contractor in the atomic-energy field except for such rights as it may voluntarily return to him. Usually, anything returned to the contractor does not relate to the atomic field as such. As a result, the United States is not developing a patent situation in the atomic field either in the United States or abroad commensurate with its inventive contributions.

Senator BRICKER. They do not have the power to take it in the first place, do they?

Mr. STEIGER. If you submit several inventions to the Commission, one might relate to a reactor and they would keep that. Maybe another one related to a Geiger counter or a scintillation counter, or some instrument, and they might give some rights back in that one. In other words, they keep what they think is important, and return back the other things.

For example, under development contracts of types 1 or 2, many invention disclosures of potential value may be sent to the Commission by the contractor. Frequently, these disclosures may relate to ideas which are not to be embodied in the product under construction.

As the Commission is in no position to patent or develop all of the ideas submitted to it, the Commission neither applies for a patent nor assigns funds for the development of the idea. On the other hand, the contractor is not justified in applying for a patent because, if he obtains a patent of value, the Commission may take ownership under the terms of his contract. This also means that the contractor is discouraged from spending his own money for the development of that particular invention as he has no idea what his ultimate patent protection will be, if any. Consequently, nothing happens to many of these ideas and the United States public receives no benefit whatsoever.

In other words, they go down the drain.

Reference is now made to page 660 of the background material for the report of the panel, reading as follows:

> The consensus of the seminar was that the provisions of section 152 are unnecessary. They add no protection to the public interest beyond what was already provided in patent law. They do not supplement the compulsory licensing provisions in other sections of the act; they introduce requirements which may prevent the Government from obtaining a patent under certain circumstances in which the required affidavits are not filed in time; and, they provide an advantage to foreign inventors inasmuch as the foreign inventor is not bound by the provisions of section 152.

Upon the elimination of section 152, regulations could be promptly issued by the Commission whereby the Commission must notify the contractor within some fixed period such as, for example, 6 months, of its intention to apply for a United States patent or not to apply. If the Commission decides not to apply, then the contractor should be given the opportunity to apply. If the contractor applies, then the regulations should clearly provide that ownership of the patent resides in the contractor subject to a free, nonexclusive license reserved to the Government for governmental purposes.

With respect to supply contracts, type 3, there is no justification whatever for the Commission insisting upon any patent right as this involves the purchase of articles produced by a contractor in his normal and conventional business or produced as a result of the manufacturer's know-how acquired over many years of prior experience. In other words, the Government is merely paying for the product and is not paying for research and development. Usually, such contracts are for a fixed price.

On the subject of access permits, type 4, the Commission no longer requires applicants to grant patent licenses to the Government. This is a recent and encouraging change in policy and is possible under the present act. However, the Commission's hands are still tied on any other contractual arrangement between the Commission and a contractor where the relationship is of a closer order than that of an access permit.

Representative COLE. May I inquire of Mr. Steiger: Would you not concede that the Commission could relinquish any claim under contracts within the classification of type 3, as they have done under these access-permit contracts?

Mr. STEIGER. Well, there should be no patent clauses in type 3 contracts; that is a supply contract and it is buying bolts or nuts or some standard commodity.

Representative COLE. My question is: Does not the Commission now have authority to waive any patent interests under a contract which you include under type 3?

Mr. STEIGER. I do not think so.

Representative COLE. Of course they can.

Mr. STEIGER. Maybe they can.

Representative COLE. Excuse me; I am asking the questions.

Mr. STEIGER. I think they have gone too far under type 3 under the law.

Representative COLE. Under the atomic-energy law, the Commission has the right to waive any of its patent rights, if it wants to.

Mr. STEIGER. If it wants to; yes.

Representative COLE. I am speaking about the authority of the Commission to do with respect to type 3 contracts what you say was a wholesome thing the Commission did with respect to type 4 contracts. I am asking you if they cannot do, under type 3, the same thing they did with type 4 contracts.

Mr. STEIGER. I think that they can.

The present act and practices are decidedly in favor of the foreign inventor. He is free to obtain patents in this country on any invention he may make and own title to the same with no obligation to the United States Government. He is free to assert his patent against the United States Government or any individual. Therefore, give the United States inventor as much latitude as possible in developing his patent position for, unless there is some such change in the present practice, the patent position in the United States will be controlled in the future to an abnormal extent by foreign nationals. It may be interesting to note at this point that about one-sixth of all patent applications of every kind presently pending in the United States Patent Office have been applied for by foreign nationals.

I believe we should encourage foreign nationals to bring their inventions to this country, but give the United States inventor the same opportunity.

Representative COLE. May I inquire: Can you give us to what extent there are applications by foreign nationals in the atomic-energy field?

Mr. STEIGER. I cannot tell you that, sir, because patent applications are secret, you know. They are not accessible to the public, but only to the inventor's attorney.

Representative COLE. I thought perhaps—I do not see why there should be any secret about whether the number of nationals which have applied for patents should not be disclosed.

Mr. STEIGER. I do not have that information from the Patent Office.

Chairman ANDERSON. Mr. Cole points out the information that one-sixth of all patent applications of every kind have been applied for by foreign nationals, and would you have any difficulty in finding out how many in the atomic field have been applied for by foreign nationals?

Mr. STEIGER. I do not know whether the Patent Office could supply that information.

Chairman ANDERSON. Would it be necessary to have that to give point to your criticism?

Mr. STEIGER. I do not believe, if you had the figures right today, I do not think that they are important. I am thinking of the future. My guess would be you would not find many as of today, but I am thinking of the next 5, 10, or 15 years.

Representative COLE. I would rather not guess about it, but I appreciate your inquiring of the Commission on Patents to see if we can find out to what extent foreign nationals are presently applying for patents under the American laws.

Mr. STEIGER. I think it is going to grow. I think we are going to have a situation worse than the jet-engine situation we had in this country.

Chairman ANDERSON. Could I ask the staff also to make inquiry on that point?

Mr. STEIGER. Under the present act, the Commission has the right to take title to foreign patents as well as domestic patents of United States nationals. This means that a United States contractor is in a difficult position to acquire a foreign patent in order to offset his competition in foreign countries. It is recommended that, if section 152 is eliminated, regulations be issued by the Commission to the effect that domestic contractors—whether or not they have any relationship with the Commission—are entitled to apply for and own foreign patents subject, of course, to security restrictions. The United States national should be free to use his foreign patent in any way he desires consistent with the laws of the foreign country involved. These foreign aspects should certainly not be delayed for another 3½ years; otherwise, the United States national will be at a decided disadvantage in the present competition for world markets.

Senator BRICKER. Do you know of any such patents that have been granted to aliens?

Mr. STEIGER. In this country, sir?

Senator BRICKER. Yes.

Mr. STEIGER. No; I know some in Europe. You see, it takes 3 to 5 years for a patent to issue in this country, so that, until the patent issues, we know nothing about it. Patent applications are pending a long time in this country and while they are pending no one has access to them except the inventor or his attorney. So we know nothing about it until the patent issues.

Senator BRICKER. You do not know of any patents that have been issued to aliens since the passage of the 1954 act?

Mr. STEIGER. Oh, yes; there have been some.

Senator BRICKER. In the field of atomic energy?

Mr. STEIGER. Yes; there have been patents issued to aliens.

Senator BRICKER. And do United States firms have any contracts with them for the use of those patents?

Mr. STEIGER. No, but the most important patent issued to an alien is the Fermi patent.

Senator BRICKER. That was a long time ago.

Mr. STEIGER. Issued sometime ago; yes, sir.

Senator BRICKER. That has been paid for.

Mr. STEIGER. Yes.

Senator BRICKER. It is now in the hands of the Government.

Mr. STEIGER. The United States Government owns it; yes.

So far as our Government's agreements of cooperation with foreign governments are concerned, these agreements are substantiated by the many inventions and patents presently owned by our Government, as well as by future inventions that may be made by United States Government employees.

We also urge the elimination of section 152 for another reason, that is, the required reporting statement under oath. This statement is unnecessary and burdensome. In every contract between the Commission and private contractors where patent rights are involved, the rights of the respective parties are specifically spelled out in the contract. Having concluded a contract, each party knows where it stands with respect to its patent rights and must abide by the applicable provisions. There are thousands of existing contracts between the armed services and private contractors containing various types of patent provisions to which the contractor must adhere. These frequently include the reporting of all inventions to the Government that are made under the contract.

The patent provisions of these contracts are patterned generally, after regulations established by the armed services. Although there is no law governing the reporting of these inventions, the procedure under the armed services contracts has worked admirably for many years. The present atomic energy law, in section 152, merely places an extra burden on the Commission, and Patent Office, the inventor, and the contractor, not only with respect to the atomic field, but anything "useful" in this field.

The panel does recommend a perfecting amendment to section 152 with respect to possible difficulties in obtaining a statement from the inventor within the 30-day period. This amendment appears to be a minor matter as contrasted with the broad implications of section 152.

Senator BRICKER. That is purely a technical objection, and it has nothing to do with the substantive law of patents.

Mr. STEIGER. That is right.

The present act should also be amended at this time because of section 155, Prior Art, which is badly in need of clarification. In our opinion, this section, as it stands, may very well seriously retard the advancement of this art in this country. It broadly provides that—

the fact that the invention or discovery was known or used before shall be a bar to the patenting of such invention or discovery even though such prior knowledge or use was under secrecy within the atomic energy program of the United States.

Under the provisions of this section, a private contractor spending his own money has no way of knowing whether a patent he obtains is valid or invalid. This is because merely a sketch or a drawing in the secret archives of the Commission may invalidate his patent. Such a private manufacturer may make an invention and apply for a patent. He may hope and expect to develop a new product. He may spend a great deal of time and money in the development of this particular product, in the hope and expectation of obtaining a patent of commercial value. Ultimately, his patent may be invalidated because of some prior secret knowledge, such as only a sketch or drawing, which has never been built or used, and has never given the public or the Government any practical benefit. Under the law as written, therefore, a manufacturer would find it difficult to justify the investment of much time and money in such an enterprise, and an individual would have great difficulty in obtaining the necessary financing.

Senator BRICKER. Is the interpretation of the patent, or the application for a patent under those conditions where there was only a draft or a drawing that had been filed or a sketch, as you say—has that been

interpreted as such prior knowledge or use under the secrecy within the atomic energy program of the United States?

Mr. STEIGER. You mean by the courts, Senator?

Senator BRICKER. No.

Mr. STEIGER. There has not been time.

Senator BRICKER. Is it so interpreted by the Commission?

Mr. STEIGER. I have never discussed it with the Commission. It is too early yet, and there are no cases on that.

Senator BRICKER. This is anticipatory, entirely, then. This is not at present of any great consequence, but it is anticipatory of what might happen.

Mr. STEIGER. Yes, because the law is very clear and precise.

We believe that the standard for patentability in the atomic energy field should be the same as prevails in all other arts under our patent statutes, modified only to such extent as may be required by matters peculiar to this new art.

Representative HOLIFIELD. You know the reason that was put in there, of course, was the fact that the Commission has used processes and techniques and hardware which are of vital nature to the defense program, and it was put in there to protect the Commission from some private individual going out and utilizing that knowledge possibly, having had access to it, to obtain normal patent rights on it.

Mr. STEIGER. We agree with that, as you will see from my recommendation. The inventor should not come along and patent something that the Commission had already built or used.

Senator BRICKER. That is the reason I asked you my former question, as to whether or not there had been an interpretation of the filing of a drawing or of a blueprint or something of that kind, as meaning that the Government had had prior knowledge and use.

Mr. STEIGER. There have been no cases on the point, and it is too early, but the law is clear that a drawing or a sketch that they had in the files somewhere and did nothing with, would invalidate a patent.

Representative HOLIFIELD. Well, of course, a drawing or a sketech of some device, whether they used it or not, they may be using a more efficient device in place of it, but still it would be of vital interest to the nation that it not be publicized, and, of course, if patents were granted, it would be publicized.

Mr. STEIGER. That is contrary to the patent laws of all of the countries of the world. In accordance with our patent law, or almost any other country, if you want to protect your rights as an inventor you have to do 1 of 2 things, you either have to build the thing so that the public benefits, or you have to apply for a patent so that the patent issues and the public learns about your invention. But when you invent something and you hide it in your desk for 10 years, you have lost your rights if someone in the interim comes along.

Representative HOLIFIELD. I recognize that, that point that you speak of there, but you are faced with a situation here where the keeping of that knowledge in the desk, as you call it, in the desk drawer, is of advantage to the Nation, because we are talking about processes and gadgetries that have to do with building weapons, and if those processes and gagetries that are held in the desk, whether they are used or not, if they have to do with the making of plutonium bombs, it is in the national interest that they be held there. We cannot apply

the same rules as are applied to a new cook stove or a new refrigerator.

Mr. STEIGER. Of course, as you know, there are no patents in the weapons field. The weapons field is different. I am speaking outside the weapons field.

Now, if the Government has a piece of paper hidden away down in the desk, there is nothing to stop them from using that process and making that process, or making that product.

Chairman ANDERSON. Let us get to the guided missile. It is the hope eventually that guided missile application can be useful in the transportation field, and providing power for space ships or airships or something that might travel at extremely high altitudes. You hear stories all of the time that they are going to cross the ocean in a few minutes, or a few hours, at least. Now, all of those things that they are now working on may be somewhere in the laboratory that is operated now by one of the recognized firms. The Government has spent a tremendous amount of money on that research. Is it your contention that if they decide to build type A of a guided missile, instead of type B, even though they have worked out millions of dollars worth of experimentation on type B, and those plans then are just lying there, as you say, in the desk, that someone can patent them thereafter, if they had application, to transportation?

Mr. STEIGER. If the Government has spent money, like you said—in the development and so forth—they would be doing something with the invention, and the public would get a benefit out of that. Anything that they work with or do something with, they get a benefit.

Chairman ANDERSON. But suppose they take the other course—and we can get into classified material quickly to tell you what I am trying to say—suppose they decide that they will not take one concept and go to a wholly different concept. And yet they spent millions of dollars on the concept which they rejected, and they have all of those plans filed away in the drawer. We will say that some firm like the Republic or Martin or someone else making a guided missile puts those in the drawer and does nothing with them.

They are not patented, and they are not utilized.

When the guided missile field gets active in transportation—would you think they had a right to patent those?

Mr. STEIGER. Well, the only time the public benefits is when you have an idea and do something with it. If the Government has got something it does not intend to do anything with, the Government, for example, could protect itself by filing a patent application. It could place it under secrecy. That is all they have to do, and they are protected. The point I am making is that they do nothing with it, and it just lies there.

Representative COLE. How does it make it easier? You said one of your criticisms of the act of 1955 was that it discourages the prospective inventor from spending money on the prospect; that after he succeeds it may be disclosed that the Government had this drawing in the drawer. But now you say, the alternative is that the Government, instead of putting that drawing in the drawer, could file a patent. How would this prospective inventor know about that filing? Would he not be subject to the same uncertainties even though the Government did file?

Mr. STEIGER. If he files, that will get into interference in the Patent Office.

Representative COLE. Even though it is secret?

Mr. STEIGER. As soon as the secrecy is removed. But the applicant will get notice that his application is delayed in the Patent Office, and when he gets that notice of delay he knows that there is somebody else in there. He gets a notice from the Patent Office if his application does not go through in the normal routine.

Chairman ANDERSON. That would tell him that the idea had military significance and would not that be useful to a man trying to find out which direction this country was going?

Mr. STEIGER. I do not believe so, Senator.

Chairman ANDERSON. In any event, the patent is going to take several years before it issues, as you point out, and is it not true, as Mr. Cole has said, that it would be many years then before he finds out, and he goes ahead with all of this experimentation just the same?

Mr. STEIGER. He would do as he does today. When he files a patent application today, we will say, on a product, he is not sure he is going to get a patent. He makes a search of prior art, and he knows the prior art, and he feels that he is reasonably sure, it is a reasonable business risk that he gets a patent, and so he goes ahead and spends money on that basis. He may find himself wrong.

Chairman ANDERSON. Do you think that powerplant that went into the *Nautilus* is of any commercial importance for later on? I am just wondering how you would protect that situation. Would you patent it?

Mr. STEIGER. Is it patented?

Chairman ANDERSON. Would you patent that thing?

Mr. STEINGER. All of those inventions belong to the Government, and I do not know what the Government has done with it.

Chairman ANDERSON. If the Government does not patent it, and it improves on it in the *Sea Wolf*, in a wholly different type of powerplant, and the one they build next, and they profit from their experiences, and they develop new ones, and you finally get it up to a good point where it can be put in a commercial vessel, then is it patentable by the person who first puts it into a commercial vessel?

Mr. STEIGER. Not if it is the same as it was in the original, because he is not the first inventor.

Chairman ANDERSON. It is an improved one.

Mr. STEIGER. The only patent he could get would be on what improvement be hame. That is the way any art progresses, and if you take the automobile art, the way any art progresses is on improvements. Patents are granted for improvements. Someone designed the first automobile, and it has been improved year after year—one improvement superimposed upon the other, and one invention made after the other—until eventually, the present-day car bears little resemblance to its original counterpart. That is the way this atomic energy art will work. You cannot discount improvements. Improvements are the things that make the art advance.

Chairman ANDERSON. All right.

Mr. STEIGER. Our point is that if the Government is not going to do anything with it, why not permit the private inventor to spend his own time and money in trying to do something with it? Then the public will benefit. Of course, keeping in mind that there are no patents for missiles. We are out of the missile field now. There are no patents.

Chairman ANDERSON. But there are so many of these patents that have a dual purpose. In other words, they might be patents that would apply to a reactor which makes plutonium for weapons and it would apply to a reactor that would make electrical power.

Now, where you have that duality of use, you in a sense have to protect the weapon use, and by protecting it, you do file in the field of reactor technology.

Mr. STEIGER. Yes, but then the Commission or the Patent Office can make that secret if they think that should be done.

Representative HOLIFIELD. That is where you are faced with this duality of function of a lot of this hardware and a lot of these processes and techniques. That is what makes it a difficult thing for this committee to draw the line.

Mr. STEIGER. I think Mr. Holifield, as long as the Commission—and they always will have—the Commission and the Patent Office have the right to make any of these things secret and refuse permission to patent abroad, that part of it is under control.

Representative HOLIFIELD. Do you not think the elimination of 152 would take away from the Commission the protection which it needs in that field?

Mr. STEIGER. No. We have thousands of contracts with National Defense, for years, where every invention made under that contract must be reported to the Government. That has worked beautifully for years, because the contractor is under contract to report every invention and send a sketch of every invention he makes down to the Navy or the Army or the Air Force and they keep a complete record of it.

Chairman ANDERSON. Will you proceed.

Mr. STEIGER. The Cole bill, H. R. 5167, endeavors to overcome the objections which we voiced in our last testimony but we believe that the provisions in the Cole bill are not quite adequate. Consequently, we urge that section 155 be rewritten as follows:

SECTION 155. PRIOR ART

In connection with applications for patents covered by this chapter, patentability shall be determined in accordance with section 102 of the United States Code, title 25, Patents—

As far as I have gone you can judge patentability the same as you judge it in anything else, with the exception—

except that prior secret use by the Atomic Energy Commission shall have the same force and effect as prior public use, and except that papers published by the Technical Information Service of the Atomic Energy Commission shall have the same force and effect as printed publications.

Chairman ANDERSON. Would you add there also these words: "except that prior secret use by the Atomic Energy Commission or any of its subcontractors"?

Mr. STEIGER. I intended that, yes, sir.

If our suggestion is adopted, patentability in the atomic field would be determined in accordance with established patent law with two exceptions, namely, prior secret use by the Commission and papers published by the Technical Information Service of the Commission. The courts and the public have had many years of experience with the standard of patentability established under our normal patent laws and this standard should be adhered to as closely as possible in order to avoid uncertainty and confusion.

NAM, therefore, recommends that the patent provisions of the Atomic Energy Law of 1954 be amended as promptly as possible. More specifically, we recommend that—

1. Section 152 of the present act be deleted in its entirety;
2. The Commission be directed to issue regulations such as suggested heretofore premised upon the elimination of section 152; and
3. Section 155 be rewritten as herein suggested.

I might like to add, with regard to section 152, perhaps you have it in front of you, that it is quite a potent thing under which any employee of the Commission must operate. The first sentence begins:

Any invention or discovery useful in the production or utilization of special nuclear material or atomic energy made or conceived under any contract, subcontract or arrangement or other relationship with the Commission, regardless of whether the contract or arrangement involved the expenditure of funds by the Commission, shall be deemed to have been made or conceived by the Commission.

Then, of course, it provides that the Commission can give something back. But if I were in the Commission and operating under that law, I would be very conservative and very careful what I gave back.

Representative COLE. Will you read the rest of it?

Mr. STEIGER (reading):

Except that the Commission may waive its claim——

Representative COLE. Read that a little bit louder, will you.

Mr. STEIGER (reading):

Except that the Commission may waive its claim to any such invention or discovery if made or conceived by any person at or in connection with any laboratory under the jurisdiction of the Commission as provided in section 33, or under such other circumstances as the Commission may deem appropriate.

Representative COLE. It is wide open; is it not?

Mr. STEIGER. I do not think so, Congressman.

Representative COLE. Except for the due caution which any responsible official member of the Commission would normally exercise. Subject to that limitation, the Commission can waive anything it wants to.

Mr. STEIGER. On the other hand——

Representative COLE. There is no restriction.

Mr. STEIGER. As you understand, though, better than I do, any commission employee is rather sensitive to being investigated or called before any congressional committee and so forth.

Representative COLE. I do not think an employee is subject to that sensitivity, but I am sure members of the Commission are.

Mr. STEIGER. So would not the tendency be to be extremely conservative?

Representative COLE. Yes, it would. You are right.

Mr. STEIGER. Do you think it shackles them to some extent?

Representative HOLIFIELD. I think it shackles them, because it refers to section 33, which has to do with research for others, and then under such other circumstances as the Commission may deem appropriate. And I declare that the Commission cannot deem appropriate procedures which would not be in harmony with section 152, and section 152 plainly has as its main purpose the protection of the Government from the encroachment of private individuals in the establishment of private rights upon techniques and inventions which have been ob-

tained or conceived during Commission contracts, where the Commission has spent the taxpayers' money.

I would take a little different opinion than my friend on my left here, and I would say that it would shackle them, and they might well be shackled, else all of the rest of the language in section 152 is of no effect.

Mr. STEIGER. All we say, gentlemen, is that if an inventor submits an invention and if the Government is not interested in doing anything with it, and if the Government feels it is safe to do so from a security standpoint, give the invention back to the contractor, and let him patent it and let him spend his money on it if he wants to. Let us do something with it. Now, in all cases, the Government is to keep a nonexclusive free license, so it is always protected. Why throw it away? If we are going to do that, we are not going to be able to compete with foreign countries who are very, very patent-conscious, and very, very anxious to obtain a patent situation in this country, and to obtain royalty income in hard currency.

Of course, give the American inventor a chance to build a foreign patent situation so he has something to trade with when he goes after foreign business.

Representative HOLIFIELD. I am impressed with your argument on the point of accessibility of the foreign patents and denying them of patents in this country. I am really impressed on that point very much. But again we come up to this same problem, which all of us know about, and that is that many of the techniques and the hardware that has been developed in this country are not only useful for weapons but they betray the advancement of our technology to foreign nations, and in many instances, if they were publicized, would allow foreign nations to immediately obtain those techniques. I think they could judge pretty well where we stood by the very fact that they were made public.

Mr. STEIGER. Well, of course, according to our claim——

Representative HOLIFIELD. I am speaking of those with dual uses.

Mr. STEIGER. Give him back those that meet two conditions. One is that the Commission does not intend to do anything with it, and two, it thinks it can give them back to him without affecting our security.

Representative HOLIFIELD. Well, I will take the second one, but I certainly could not take the first one, because the fact that the Commission does not proceed to put into effect a discovery does not indicate that the discovery might not well be used to our disadvantage in a foreign country that is not quite so far advanced as we are. We might have two processes there, one of which was more efficient than the other, but the inefficient use of the first might well be of disadvantage to it.

So, if you would base it on your second provision there, I think that you would have a strong position.

Mr. STEIGER. I meant both. There are two considerations.

Representative HOLIFILD. I know you did, but I cannot go with you on the first one.

Mr. STEIGER. It has to pass both of the tests.

Representative HOLIFIELD. I thought that you meant alternatives.

Mr. STEIGER. No.

Representative COLE. Is Mr. Steiger going to read his conclusions? I thought it was quite pertinent, because that leads me into another question.

Mr. STEIGER. Yes, sir.

In conclusion we would like to repeat that in wanting to enlist the vast potential of private ingenuity and resource in developing this art, it is absolutely essential that the rules be such as to make the field attractive to private enterprise.

Representative COLE. What has happened to the attitude of the National Association of Manufacturers with respect to section 153? In previous years, the NAM has been lukewarm toward it, and I thought some of them were rather hostile to it. If you speak for NAM, you are completely silent about section 153.

Mr. STEIGER. The NAM objects in principle to compulsory licensing.

Representative COLE. And it is still opposed to it?

Mr. STEIGER. We still oppose compulsory licensing.

We think in this connection, as far as this particular situation is concerned, as I have said before here, it is primarily academic.

Representative COLE. What do you mean by that?

Mr. STEIGER. I doubt if there would be any such patents, that is, of the kind that someone cannot build a successful powerplant or a reactor without. We do not believe there will be patents that are that fundamental, as there has been too much published already, and too much that is known.

Another thing, of course, is that it applies only to inventions made until 1959, and we do not like it, frankly, because we do not like it as a matter of principle. We think as a practical matter it does not mean very much in this act.

Representative COLE. That might be conceivable, but still you cannot very well say that the principle of compulsory licensing is one that does not discourage private enterprise in this field.

Mr. STEIGER. It discourages a small specialty manufacturer, yes, sir. It does not discourage the big manufacturer.

Representative COLE. Well, only for the record, my attention has been called to your statement of last year, in which you say in one of your opening sentences:

> First of all, there are sections 153 and 154, relating to compulsory licensing of patents. NAM objects in principle to this provision because it is not in accordance with the spirit of our Constitution.

I was curious to know to what extent, if at all, the NAM had altered its attitude with respect to policy and constitutionality.

Mr. STEIGER. Our attitude has not changed.

Representative COLE. It has not changed.

Mr. STEIGER. No, we feel, though, that this thing has been in effect this long, and it has a date of 1959, and we think it is academic and so we did not make a point of it here today.

Chairman ANDERSON. Thank you very much.

Mr. STEIGER. Thank you, gentlemen.

STATEMENT OF DR. W. F. LIBBY, A MEMBER OF THE UNITED STATES ATOMIC ENERGY COMMISSION

Chairman ANDERSON. Dr. Libby, before we go into that, I wanted to explain my interest in this Silvey matter.

It is not that I think that the Commission has reached a wrong conclusion, but Dr. Silvey wrote on November 16, and among other things he said, "We would like to procure the proper papers to send the Atomic Energy Commission an application for an FOA contract to investigate this problem." He expresses why he thinks it would be good, and the work he did in the University of Michigan—he does not ask for any money. He wants a chance to make an application.

Then the reply that he got says that—

This is in reply to your letter of November 16. I discussed your inquiry with the Commission's sanitary engineering group and we have the following comments to make—

And then they proceed to point out that the thing would be no good. Even if they raised this radiation to 10 to the 6th power, they would be able to pass only as high as 5.5 gallons per hour as it flowed by, whereas, at Oak Ridge you are handling hundreds of thousands of gallons of water, and therefore, the only conclusion is that—

Therefore, we will not let you make an application for this study contract.

It seems to me a fellow ought to make his application for how much money he wants, and he may have the money and all he may need is the process. It just struck me that it was a pretty quick turndown.

I may not be fair about it, but it did strike me that it was.

Dr. LIBBY. We will look into the matter, Senator.

Chairman ANDERSON. I am not trying to say that I think this particular application was a good one. I question whether it is wise to say, "You send us a suggestion we do not think has any merit and we just will not even let you apply for a contract to develop it."

Dr. LIBBY. Our general policy is to further these uses in every way we can.

Chairman ANDERSON. I am sure it is yours, and I believe it is the policy of the Commission. That is the only reason I returned to it. Thank you.

All right, Dr. Farr.

Representative COLE. On that point, Mr. Chairman, I can agree with what you have expressed in part, but where the Commission knows that its funds are limited and allocated for research purposes, and a person writes in asking for papers on which to make application to set up a project, if the Commission feels that that project might be of doubtful value, even though it had the funds, where the Commission knows that it does not have sufficient funds, it seems to me that it is quite proper for the Commission not to encourage the man by sending the application out to him and costing him the time of preparing it and sending it back and knowing all of the time that probably it will not grant the application, I think that there are considerations on the other side of it as well.

Chairman ANDERSON. I think that I would agree on that.

STATEMENT OF DR. LEE E. FARR, CHAIRMAN OF THE MEDICAL DEPARTMENT AND MEDICAL DIRECTOR OF THE BROOKHAVEN NATIONAL LABORATORY

Dr. FARR. I am Dr. Lee E. Farr, chairman of the medical department and medical director at Brookhaven National Laboratory. Gentlemen, I regret that a travel engagement prevented me from preparing a statement which I could give you ahead of time.

There are some remarks that I would like to make in regard to the report by the committee. That is, the McKinney Panel.

Chairman ANDERSON. We did not get the panel report in time so that the members of the committee could sit down and study it paragraph by paragraph and dissent if they wished to from individual paragraphs. Therefore, we took the whole panel report and published it, and therefore no member of the committee is obligated in any way to subscribe to anything that the panel report has in it. Some may agree with it all. And therefore, I am suggesting that if you will say "panel" when you mean that report, we will appreciate it.

Dr. FARR. Thank you. My remarks are concerned with that portion of the report which has to do with medicine primarily. The report concerns itself with the dissemination of knowledge on the usefulness of atomic energy in medicine, and to a degree by implication in that particular part of the report of the development of medical technology.

Now by "technology" I mean the application of basic and fundamental knowledge to a useful and practical fulfillment of a specific need.

Implicit in the report which concerned itself with the dissemination of knowledge is the requirement that there be knowledge to disseminate. In the United States we are technologically minded, and we are interested in the immediate practical application of many advances of science because we have seen this develop over the years to our great benefit and advantage. We are prone to forget that technology cannot advance without basic scientific information and we at Brookhaven—and I will speak directly from my own experiences there in the medical department—have been brought face to face with the situation which occurs not only in medicine but in other fields of science. That is, that at one and the same time we find ourselves responsible for making a broad advance in basic science, for making some development of the applications of this knowledge, and for disseminating this knowledge to a degree at least to other sources which may then in turn disseminate it widely throughout the United States.

I think it is very important that these three functions be kept clearly in mind in reading this report because one can read it to mean that in part the national laboratories may be called upon primarily to disseminate knowledge or to provide some early, let us say, pilot-plant type of experiment for technological development to the exclusion of basic science.

I believe it is very important that basic science be protected and be cultivated and be encouraged in every way in the United States.

The national laboratories occupy a unique position in our scientific world in the field of atomic energy, because they are at the present time the only institutions wherein the large instruments and machines for atomic energy are available to qualified scientists from universi-

ties to discover more basic knowledge upon which our future technology depends. If I may illustrate this briefly from our own experience, you gentlemen are well aware of thestudies which we have been carrying on in neutron-capture therapy for the treatment of a type of brain tumor. The efforts to date have revealed in certain areas lack of knowledge and instrumentation which we are in the process of developing. Part of this is technology such as the development of a reactor which could be specifically applied to medical problems.

This was largely a matter of dollars, time, and material. Over the past 2 years, with the assistance of nuclear engineers and physicists we have designed a reactor which we think will fulfill the needs of this type of medical therapy. It will at least provide us with an instrument which will be capable of proving the fundamental hypothesis on which this therapy is based. This is pure technology.

To a degree, of course, our program must be delayed until this reactor is available to us for further treatment. But at the same time, perhaps the larger barriers to a more rapid advance in this field are a lack in our knowledge regarding fundamental behavior of individual cells in the intact human organism. As you gentlemen are well aware, the exposure of an entire individual has quite different implications from the exposure of a portion of that body to radiation.

The opportunities for basic study, to observe, to determine, and to classify the effects of radiation on the mechanisms of the body have not been available in the past except for X-rays. It is necessary that we now endeavor to determine those effects from neutrons and capture elements in order (1) to determine the applicability of this system to a general attack on the cancer problem, and (2) to determine the hazards that may be involved for the normal tissue which always will surround any cancerous growth within the human body.

We must have much more information on how materials leave the blood stream and are transported to the individual cells of the body, that is, how they actually pass through the walls of the cell and what is their fate once they enter into the chamber of the cell.

This is very fundamental work, and yet dependent upon it is a further advance in a particular field, one field of the application of atomic energy to medicine.

I think that this experience, to a degree perhaps, exemplifies better than I could describe in any other way the need and the necessity for the encouragement of basic science investigation. At the same time that we are looking forward for new facts we must provide for wide dissemination of this information both technical and basic to our colleges and universities and industries.

I think care must be taken that too much responsibility is not placed upon too few people in the present existing atomic energy installations to perform the functions of a university, college, and institute. I define a college in this instance as President Griswold of Yale did in his last report to the alumni, in which he said that the college exists primarily for the dissemination of information, and the university exists for the creation and dissemination of knowledge. Now in this sense in the national laboratories, we are in rather an unusual position in that we are essentially a university for universities. We are creating knowledge and disseminating knowledge to universities that they may fulfill their very important function in this vital field of atomic energy. I think that this mission must be kept in mind and

every effort must be made to bring in other organizations primarily concerned with dissemination of knowledge that our basic scientific capital may be augmented and therefore our technological advancement assured.

Representative COLE. To what extent, Dr. Farr, are the laboratories used by persons other than on your staff, what you might call outsiders, or independent scientists that may have a problem or an idea that they may want to work out and bring into the laboratory? To what extent are they used, and to what extent, if at all, does the provision of the law regarding the compulsory licensing discourage or influence outside use of the national laboratories?

Dr. FARR. May I ask for a clarification on what you mean by compulsory licensing in this sense?

Representative COLE. Well, in substance, it is that a patent which may be given to an inventor is subject to use by other persons at a fee determined not by the owner of the patent but a fee or royalty determined by the Government.

Dr. FARR. I understand. First, in regard to the use of our facilities by outside scientists, we have a program which is designed to encourage outside scientists from universities, from colleges, from hospitals and medical schools and from industry to participate in the work at Brookhaven, either on problems which are already in progress there or problems originating by the visitors but which cannot be done in his own institution because of lack of facilities.

To give you some idea of the magnitude of this effort, this summer in the medical department at Brookhaven, we will have a number of visitors who will be there for approximately 3 months each, which is 50 percent of our present staff number. This is exclusive of a number of students who are presently in medical schools and graduate schools or colleges of the United States. We welcome our colleagues, and we believe that in most instances they find no real hazards, and no real difficulties in coming to Brookhaven National Laboratory or the other national laboratories for this kind of collaborative effort.

In my experience, I have not encountered any reluctance on the part of university scientists to participate in our work because of the patent situation. There has been a reluctance, and an understandable one by various pharmaceutical houses to participate in work in which we are primarily interested because of the patent situation. As I understand it, it was not entirely clear to them whether work which was engaged in at Brookhaven might jeopardize the application for a patent which was concerned with materials pertinent to that investigation.

Representative COLE. It was the uncertainty of their patent status then, I judge from what you say, caused some of the commercial houses to hesitate to take advantage of the service.

Dr. FARR. Yes, this is my understanding. Because the work would not be done entirely at Brookhaven but it might well be an outgrowth of work done at Brookhaven.

Representative HOLIFIELD. On the other hand, you have achieved a great body of information at Government expense at Brookhaven, which you have gratuitously made known to these people.

Dr. FARR. Yes, sir, we have. We endeavor to keep them informed both of our knowledge and our needs in order to stimulate them to development in this area.

Representative HOLIFIELD. Your National Laboratory research into this field is far and away the most important research that is being done in the United States, is it not?

Dr. FARR. We believe it is, sir.

Representative HOLIFIELD. I am speaking now as to the quantity of it as well as the quality, of the research projects which you have in the field of medicine.

Dr. FARR. Yes, sir, this is so. There is an area in which I believe further collaboration might be encouraged by some additional stimulus and that is in the synthesis of radioactive labeled compounds which might be used in medicine. In many instances this can be done more expenditiously, and more effectively in the commercial drug houses than it can be done in a university laboratory or in a national laboratory. I believe that encouragement should be given to these people for some type of commercial endeavor whereby, for instance, we might pay them for the compounds on a purchase basis very much as any commercial transaction might be carried out for these specifically labeled materials which might not have general usefulness in the field of medicine but would be of exceeding importance in the field of investigation.

Representative HOLIFIELD. You mean that you do not have, at the present time, the authority to do that?

Dr. FARR. We have a degree of authority to do this. There is not a mechanism at the present time existing which enables us as individuals to collate our needs satisfactorily with those of other institutions so we can give the total picture to a firm that might otherwise be interested in synthesizing these compounds for us.

I don't believe that this is a fault of anyone except ourselves, but I would like to point it out that further centralization of information in this area which is already being implemented, I think, may be of considerable effectiveness in furthering this type of effort both in the national laboratories and in the universities providing adequate support is maintained.

Representative HOLIFIELD. In the field of radiation we have had some access to some articles by some very famous geneticists doubting the advisability of these tests. What is the position of your laboratory in regard to the possible genetic effect?

Dr. FARR. You are speaking of the weapons tests?

Representative HOLIFIELD. Yes, the large weapons tests.

Dr. FARR. I cannot speak from prime authority because I am not a geneticist, but as a physician and as one who is charged with the responsibility for of the personnel at Brookhaven, I am naturally concerned with the amount of exposure that one might obtain from all sources combined.

In my opinion at the present time, there is no significant body of evidence which insofar as the human being is concerned would suggest that levels of exposure which has resulted from tests of weapons to date have introduced any significant hazard into the health of our population.

Representative COLE. That sweeps it all up pretty concisely, I would say. Do you want to go further on it? I would like to ask you to give us an equally sweeping statement which will tell us the prospect or the encouragement that you see in the field of cancer through

isotopes radiation and so forth, if you can do it as concisely as you did it on a genetic basis.

Dr. FARR. Perhaps a little more knowledge here may make it more difficult to summarize. But let me say this, it would appear from data which we have thus far that it is not at all inconceivable that in many instances we may be able to control the cancerous growth without any further knowledge of the primary cause of that cancer. We have parallels for this in other fields of medicine. There is adequate therapy, for instance, in diabetes mellitus, wherein the use of insulin permits us to treat patients satisfactorily and yet we do not know the cause of the primary disease. I believe that the use of radioactive isotopes and the machines of nuclear medicine may equally well permit us at some date to control the manifestations of cancer in the human being. I would be remiss, indeed, if I did not point out that as a possibility of these same studies, we, or someone, perhaps entirely unrelated to our present organizations and not concerned with cancer but using radioactive isotopes, might stumble across the key which would give us basic information as to the origins of cancer. I am indeed optimistic.

Representative COLE. Well, I would judge, then, that you are confident with respect to control of growth of the cancerous tissue, that is, through radiation, and that you are optimistic about finding the cause of the origin of the cancerous tissue.

Dr. FARR. Yes, sir, but I perhaps should qualify by optimism. It is a scientist's optimism that does not put a time period on the successful conclusion of this search. But as we have gone further into our studies on the controlling of deep-seated cancerous lesions in the body with radioactive isotopes, we have been increasingly encouraged that ultimately with additional knowledge we would be able to encompass a measure of control not presently possible in this dread disease.

Representative PATTERSON. Doctor, I was just wondering how these children are coming along that you showed me being treated about a year ago this time. Have you made any further advances in their particular disease?

Dr. FARR. You have reference to the children with nephrosis, wherein radioactive isotopes were not useful for treatment, but for gaining a better understanding of the basic mechanism of the disease which would enable us to control it. We have not made any appreciable practical advances since I last talked to you. Our information, however, has been growing and when this can be turned into a real therapeutic advance, is something that I cannot predict at the moment.

Representative HOLIFIELD. Thank you very much for your testimony, Dr. Farr.

The committee will stand adjourned until 2 o'clock.

(Whereupon, at 12:15 p. m., a recess was taken until 2 p. m. of the same day.)

AFTERNOON SESSION

Representative HOLIFIELD. The committee will be in order.

This afternoon we have an old friend who has been before us many times, Mr. Frank McCune, of the General Electric Co., as our first witness.

Mr. McCune, will you please take the witness chair? I understand you have a prepared statement.

STATEMENT OF FRANCIS K. McCUNE, VICE PRESIDENT OF THE GENERAL ELECTRIC CO.

Mr. McCUNE. Yes, I do. I have with me William F. Kennedy, the counsel of the Atomic Products Division of General Electric Co.

This is the fourth time I have availed myself of the opportunity to appear before your committee. I testified in 1953 during your background hearings, in 1954 during your consideration of the bills which became the Atomic Energy Act of 1954, and again last year in the first of your hearings under the new law. Each of these hearings had led to further progress in the development of the peaceful uses of atomic energy. Particularly in your constant insistence on the encouragement of private initiative, you who serve on this committee have made a contribution of enormous value.

Your role in the future development of atomic energy will continue to be indispensable. Now, as in the past, I appreciate the chance to testify here and to discuss policies which are of vital national concern.

This year the focus of your hearings is the report of your distinguished panel on the Impact of the Peaceful Uses of Atomic Energy. Those of us who have been in the field for some time can best appreciate how much work and how much reflection and judgment are distilled in the panel's report. Today I intend to address myself to a number of issues discussed in that report and primarily to the problem of atomic liability.

Before doing so, however, I would like to say that the year which has passed since your 1955 hearings has been a good one. A number of projects have been initiated, some of them financed wholly by private funds. Information is being released by declassification and under the Commission's access permit program. Plans have been made to enlarge the field of private participation. The Commission's impressive research program has continued, and has increasingly been supplemented by privately financed developmental work. The regulatory structure is taking shape. The Geneva Conference has been held and we are continuing to feel its beneficial effects. We can now envision a substantial international market; we have in this market an opportunity to improve our relations with foreign countries and to accelerate the development of an atomic industry in this country. Finally, the recent action of the President making available 20,000 kilograms of U-235 for use in our domestic programs and another 20,000 kilograms for use abroad is a major step forward.

We in General Electric have tried to make a contribution to this general picture of progress. We have, among other things, organized a separate department to carry on our activities in the commercial atomic field; we are establishing manufacturing facilities for that department in San Jose, Calif.; and we are spending and will spend substantial sums to build and to operate a nuclear research laboratory nearby in Alameda County, Calif. This laboratory will include a prototype boiling water reactor. Pacific Gas & Electric plans to provide and operate a turbine-generator which will use steam from this reactor and will produce up to 5,000 kilowatts of electricity.

In addition, we have entered into a contract with Commonwealth Edison Co. to design and build a 180,000-kilowatt nuclear plant to be located about 45 miles from Chicago. Associated with Commonwealth in this project are the companies in the Nuclear Power group. Mr. Gale, the chairman of Commonwealth Edison, has already told you about this project. From General Electric's point of view, I would like to add these observations.

The Commonwealth plant will be a pioneering project with all the difficulties which that implies. The developmental work required in order to produce the plant and fuel elements for the plant will be particularly expensive. Mr. Gale has called the $45 million price a "very favorable" one, and I will tell you that this amount does not cover all that we expect to spend on this project and that if we obtain no further business we will have lost substantial sums. Nevertheless, we took on the Commonwealth job with its considerable risks and burdens because we have faith in the atomic business, because we believe we can play a useful role, and because we see an opportunity to earn, in the future, a profit on our shareowners' investment.

We took on the Commonwealth job for another reason as well. We believe in the philosophy which underlies the 1954 act, namely, that the main burden of the peaceful development of atomic energy must be borne by private concerns. We did not want to see the Federal Government monopolize or dominate the field because private companies were in default. We felt that the best way to advance the cause of private enterprise was not to preach it but to practice it.

In my testimony a year ago I made certain recommendations about access to information, licensing, international policy, and other matters. In the intervening year the Commission has moved forward in these areas in a way which has generally been sound and helpful.

The situation with respect to access to information has improved considerably over that which prevailed at this time last year. There has been substantial declassification of information; the access permit program has provided a means of obtaining restricted data; a good deal of classified information has been downgraded; and steps have been taken to dig the available information, organize and index it, and inform industry of its availability.

This is a good record but here, as elsewhere, we should not lose sight of the fact that more remains to be done. I agree with the views expressed in the McKinney Report as to the need for additional declassification and for further action by way of collection, organization, and systematic dissemination of information to all those interested. Finally, I think that we should have a system under which information is born free and is classified only to the extent specifically dictated by military considerations.

As you know, I believe that the statute gives to the Commission broader discretion in matters of licensing than is desirable in the long run. However, the Commission shows every evidence of administering its licensing powers in a constructive manner. It appear to be confining itself essentially to matters affecting security, health, and safety. We are particularly pleased by the willingness of the Commission staff to work with an applicant on an informal basis to develop the detailed conditions of a construction permit and license while the work progresses. This is essential because industry needs to have, as early as possible, assurances which are as firm as possible,

as to the issuance of a permit and license and as to its detailed terms. Without such assurances, it cannot know whether it is wise to invest its funds in a project.

The President's announcement that this country would make available 20,000 kilograms of U–235 for use in reactors abroad and the accompanying statement by Chairman Strauss that we are negotiating further agreements for cooperation covering power reactors constitute very heartening news. However, there is still a question as to the basis on which we will supply fuel for use in foreign countries. We agree with the McKinney panel that an early clarification of the Government's policy with respect to reactor fuel is desirable. We also agree that this country should try to establish a system of controls over fissionable materials.

However, an effective system of controls may not be feasible because of the attitude of other countries, and we may have to face the issue of what our policy should be in that event. Here I speak with hesitation because a decision must be made on the basis of our overall national security and because this decision depends in part on considerations with which a private citizen cannot be fully familiar.

No American can fail to be concerned about a situation in which a large number of countries will possess fissionable material usable in weapons. However, I question whether we have a choice about this. We have no control over supplies of natural uranium, and weapons material can be produced from this source. Neither do we have any monopoly of ideas and know-how. We cannot control the actions of the other great atomic powers; nor can we assume that advanced countries cannot develop an atomic industry of their own.

Regardless of what we do, foreign countries will probably have nuclear plants and fissionable material. The real questions are: How soon, with whose aid, and with what consequences to the good will enjoyed in those countries by the United States? It seems to us that, although the problem is difficult, the balance of national interest probably lies in United States assistance for nuclear development in friendly countries. In this connection I hope that careful consideration will be given to the views of the seminar on this problem which are summarized at page 325 of volume 2 of the McKinney report.

I would also like to say that we have been pleased by the Commission's recent regulation granting general authorization under section 57 (a) (3) for certain foreign activities by American companies.

Section 152 of the act places in doubt the right of a private company to retain ownership of its inventions when the discovery was made in the course of any relationship with the Commission, even a relationship involving no expenditure of Government funds. The statute does not spell out what kind of relationship would result in vesting title in the Government. The best course would be to repeal or amend section 152. If Congress does not take such action, we agree with the panel that it is possible to clarify the patent situation by reasonable administrative interpretation. The Commission's waiver of possible patent rights under the access permit program is a step in the right direction.

The Atomic Energy Act contemplates the establishment by the Commission of a comprehensive system of safety regulations. In addition, a number of States and local bodies are becoming increasingly active in this field. There is an obvious danger of conflict and

duplication. Fortunately, the Commission and the State agencies, with the encouragement of the Joint Committee, are working to avoid such conflict and duplication. We agree with the panel that all those interested should cooperate in developing solutions in this area. Industry should be permitted to function in a reasonable regulatory atmosphere, and should not be caught in a multitude of overlapping and even inconsistent requirements.

One useful contribution which industry can make is to develop uniform technical and safety standards for possible adoption by the appropriate authorities and for voluntary use. The American Standards Association, acting at the instance of numerous interested organizations, has begun the work of developing such standards.

The significance of energy produced by fusion for the long future, both domestically and internationally, is something which this committee realizes better than I. I do not know enough to have an opinion as to the prospects of success in this program. Such indications as I have are to the effect that we have a long hard road to travel.

But we must solve the fusion problem, if it can be solved, and it is important that it must be solved first here in the United States. The inclusion of information on fusion in the Commission's access system is therefore a welcome step. The more people and laboratories and research organizations, in the universities, in industry and elsewhere, we enlist in this effort the better will be our chances of success. Moreover, although I believe that it will be a long time before the work in the fusion area will have any economic impact, I agree with the McKinney report that those who are contemplating investment in fission reactors are entitled to information which conceivably bears on the wisdom of their investments.

Representative COLE. May I interrupt there? When you concur in the McKinney observations about sharing fusion information with those anticipating investment in fission, I wonder about that. To me it creates the impression that there are those who do feel that information regarding the fusion process should be withheld from those anticipating investment in fission promotion. I don't anticipate that is the fact, and I don't believe you deliberately intended to create that impression.

Mr. MCCUNE. I said at the beginning, I believe, Mr. Cole, that the Commission has now put fusion information as information which can be obtained under the access permit system, I believe, in the secret category. This means that those who have access programs and access permits can obtain information.

Representative COLE. You say you agree with the panel report that those contemplating investment in fission reactors should have access to fusion reactors; you are concurring in a practice which is already in existence.

Mr. MCCUNE. Well——

Representative COLE. I am not aware of any fusion information that is deliberately being withheld from those contemplating fission projects. While the McKinney panel did say that fusion information should be made available, it created the inference that it was being denied presently from the fission people.

Mr. MCCUNE. I know that we have applied recently, and I know that the fusion information has been put in the categories available

under the access program rather recently, and that we have applied for such information.

Representative COLE. It is available. All right.

Representative HOLIFIELD. In using the pronoun "I" there, this presentation is as a representative of the General Electric Co., and we are to understand that that is the view of your company that you represent.

Mr. MCCUNE. That is correct, Mr. Holifield. At this point I would like to bring up one more major consideration which I believe is worthy of serious thought, and which bears very directly on what industry may do in the future. This problem arises out of the fact that industry has not, over the past years, had an opportunity to make a reasonable profit as compensation for the work it has performed. Many companies have behind them a history of amazingly successful ventures in terms of accomplishment for the national effort. But few or none have been successful in terms of providing the wherewithal for business expansion.

At present this does not seem to be a limiting influence, but we must remember that no one is looking forward to quick or certain profits and, should there be a recession and should business have to curtail, it may well be that atomic-energy progress would be set back in the process.

Let me hasten to say here that I am not voicing a plea for a particular company. As a matter of fact, this background of no profit is one to which companies like ourselves unwittingly contributed. In the atmosphere of mystery and tremendous national urgency, which originally prevailed, we and many others took it as our patriotic duty to do what was necessary without profit. I know that we felt there was an ultimate return to be made for our owners, but I believe the principal motivation was one of national urgency. This pattern has, in many ways, persisted to this day. I do not know the answer nor do I know of a specific action which must be taken, but I felt it my duty to point out that this situation is one which greatly compounds the problem of many concerns in determining the degree and extent to which they can commit funds for the future on a continuous basis.

The gravest problem now facing the atomic-energy business is that of liability for the consequences of an atomic incident. Anyone who enters a business, particularly a new business, is obliged to take some risks and, because we have a long way to go, technically and otherwise, this is especially true of the atomic business. We in General Electric do not solicit any sympathy on this account. It is the business of private enterprise to take risks. Over the years General Electric has taken many of them and over the years we have made money doing so.

It is, however, one thing to say that you will take your chances of sustaining losses, even substantial losses, and quite another thing to say that you will embark on a course where the entire assets of your stockholders are at stake, a course which might affect the stability of your company or its very existence.

The testimony you have already heard is to the effect that a serious reactor incident is very unlikely but possible and that, if one occurred, it could be of catastrophic proportions. The insurance pools which have been organized to provide atomic hazard liability coverage are at present talking of limits which in combination amount to about $60 million. Compared to normal liability coverage this amount is

high, but there is no use making any bones about the fact that it does not meet the major concern of many of us.

You may ask whether the possibility of a catastrophic incident isn't so remote as to be negligible. The answer is that it is remote. But the question is, "How remote?" And this is a question which I believe no one can answer. We have not yet had enough years of reactor operation, and each new reactor is more or less unlike each prior one. In such a situation no clear-cut determination of probabilities can be made.

The evidence so far is favorable. We have not had a serious incident. Moreover, the responsible nature of the companies building and operating reactors, the Commission's careful review of reactor design, the control and safety devices built into the reactor, and the elaborate operating procedures employed provide all the assurances against an incident that human ingenuity can devise.

The trouble is that there are limits on our foresight and ingenuity. Perhaps the best evidence of this is that the atomic industry, unlike other industries, does not yet operate under precise and specific codes. The lack of adequate experience and the rapid changes in technology have so far made it impossible to formulate such codes.

In my judgment—and, I think, in the judgment of most scientific and engineering people—we simply cannot dismiss as not worth worrying about the possibility of a major reactor incident. It is true that among technical people there are differences in the degree of concern and that there are some who are not greatly concerned. But these very differences of judgment establish that we do not know the answers. The decisive facts are that none of the technical people know what the probabilities really are and that many of them are not prepared to describe the possibility of an incident as insignificant.

That is the situation from the technical point of view, as I see it. Certain consequences follow from it.

The first set of consequences directly involves the public. What is the public interest here? It lies first in the maintenance by industry of the highest standards of care in designing, building, and operating atomic facilities. It lies also in the promulgation and enforcement by the Atomic Energy Commission of thoroughly considered and complete safety standards. If by some chance there should be an incident, then the interest of the persons affected lies in indemnification for the harm done.

A runaway reactor is not an atomic bomb. Even a serious atomic accident is not likely to result in injuries greater than would result from other hazardous industrial activities, because people can be warned away from the affected area on short notice. However, the property damage could be very great. Large areas might be uninhabitable for extended periods.

It is not clear to what extent insurance policies now cover or will cover harm from radiation hazards. However, it seems to me a fair assumption that we could have an incident where the extent of the harm exceeded both the insurance liability coverage and the assets of the company which might be legally responsible for it.

Now what is the position of the Government with respect to the people affected by such an incident? Will the Government say that it does not care about the problem? Or perhaps that it prefers not to face it? How can the Government say that? If there ever were

such a disaster, the inescapable fact is that the Government will have been involved in a variety of ways in the events that led to it.

The Commission has been aware of this problem. It is contemplating requiring that licensees, as a condition of obtaining a license, procure available private liability insurance. But this would not prove a solution where the disaster was of proportions many times greater than the private coverage required.

I have talked thus far about the consequences to the general public. Now I must ask you to look at it from the perspective of a private company which is contemplating a nuclear project and which must be concerned with the liability problem. That problem involves legal considerations.

The net of these considerations is this:

First, anyone connected with the project has a potential liability for the consequences of a nuclear incident. This includes the operator, the assembler of the reactor or related equipment, the constructor which installs the plant at the site, a subcontractor, a supplier of components, controls or instruments, the fuel fabricator and perhaps architect-engineers who do only design work. Hence we have a problem which affects just about every company in the atomic industry, whether it be large or small.

Second, it is possible that you will be held liable without any proof that you have done something wrong or that you have failed to do something you should have done. At least in some cases, liability might be based on the idea that since the activity is a hazardous one, you must make good the harm caused to others, even though you were not careless or at fault in any way.

This is the doctrine of absolute liability and I understand that a number of commentators, including the General Counsel of the Commission in a paper prepared for the Geneva Conference, have suggested that this doctrine may apply in the atomic field.

Third, even if legal negligence is to be the basis of liability, we should keep in mind that we are in a new and experimental field. It will be a rare case where any activity is carried on in such a manner that, if you had to do it over again, you wouldn't do it a little differently or a little better. No one bats 1,000. It is almost always possible using hindsight to find some error.

The degree of care which the law requires is that which is reasonable in the circumstances. But this is a very general standard and juries have some flexibility in applying it.

Fourth, a company might be held liable for a nuclear incident resulting from acts or omissions of any employee in the course of his employment, no matter how junior or subordinate a position that employee might occupy.

Fifth, the risk of liability may extend for a very long, long time. As far as the operator is concerned, it lasts for the life of the reactor. This may also be true for equipment suppliers and others. Liability to third parties does not necessarily end at the time of sale. In some States, statutes of limitation may not even begin to run until an incident has occurred.

Now, these are risks which a business enterprise expects to take in normal situations because experience has shown them to be of moderate proportions and because it is feasible to insure against them. But the possibility of an incident of catastrophic proportions adds a

new dimension to these otherwise conventional legal rules and makes the problem one of the utmost gravity for any responsible management.

It is one thing to say that one will accept as a normal risk of doing business the possibility of being held liable in moderate amounts. But should a company be expected to embark on an enterprise where the technical risks are compounded by the legal uncertainties and where its very existence may in the end have to ride on a verdict which a jury passes after the fact?

As some of the members of this committee have recognized in their questions to other witnesses, the atomic hazards problem is essentially the same, regardless of whether atomic facilities are built with government money or by private financing. Government ownership of reactors does not solve this problem.

From the point of view of the public, the harm would not be less severe because the reactor is Government-owned rather than privately owned. Moreover, the persons harmed would have the same interest in obtaining indemnity for their loss.

Take it next from the point of view of industry. The Government presumably would turn, as it always has, to private firms to design, build, and operate the plant. The designers, manufacturers, builders, and suppliers run a risk of liability to the general public regardless of whether their customer is a private utility or the Government. The operator could have a liability to the general public regardless of whether it runs the plant for its own account or for that of the Government. This was apparently recognized in the Shippingport job where the Government has undertaken by contract to indemnify the Duquesne Light Co. against atomic hazards liability.

Look at it finally from the point of view of the Government. Suppose it provides, by contract, indemnity against atomic hazards liability to participants in Government-financed projects; then its position is not essentially different from the case where it provides pursuant to specific legislation indemnity to participants in privately financed projects. If, on the other hand, it grants no indemnity in Government-financed projects, how can it be suggested that the liability problem is solved?

The panel report states that—

> * * * At least 2 and possibly 3 years remain in which to conduct research and accumulate knowledge and experience before any substantial private activity can be delayed or stopped because of inability to obtain adequate insurance * * * (p. 12).

The report has so much to say on other matters that is essentially sound that I hesitate to take issue with it. Nevertheless on this point I must disagree. What can we accomplish in 2 or 3 years? Acquire more technical knowledge? Yes, but we will hardly be able to require enough to permit us to say that all possibility of catastrophe has been removed. Arrange for increased amounts of private insurance coverage? Perhaps, but it seems unlikely that this coverage will be increased enough.

Nor is it wise to assume that private activity will not be delayed or stopped. The dilemma faced by a company considering a nuclear project is this: Should it spend substantial sums now in the hope that the atomic liability problem will be resolved by the time the reactor is ready for operation? There seems to be a real danger that some major

private activity will be delayed by the lack of a solution to the liability problem. Certainly you have already received testimony showing the concern of many managements about this problem.

The job of framing legislation is, of course, that of the committee. We have, however, some tentative ideas which I am submitting here for your consideration.

First, the legislation should provide indemnity against atomic hazards liability to all those who may incur such liability in connection with any nuclear project.

Second, the legislation should provide for a periodic review of the situation by your committee and by the Congress so that it will not continue in effect any longer than needed. However, in view of the problems which I have mentioned about the duration of the risk, it is important that once an indemnity is granted, it covers any event occurring during the life of the facility.

Third, the indemnity provisions should cover liability only above the amount of insurance which is determined to be available in the private market on a reasonable basis.

Fourth, any legislation should avoid a complex administrative setup. No elaborate organization is needed to administer an indemnity program.

Fifth, the Joint Committee should examine carefully the question of whether industry should pay for this protection and, if so, on what basis. I think that industry is willing to pay and speaking for General Electric I can assure you that we are. On the other hand, we are not talking about insurance in the usual sense. There is no point in glossing over the fact that no one can estimate either the probability of an incident or its magnitude, rates cannot be set on a conventional basis. Not only will rates be difficult to set but the amounts collected may not justify the costs of a modest collection system. Moreover, in determining whether industry should pay, it should be borne in mind that although an incident is possible, that possibility is remote.

Sixth, the legislation should apply to Government facilities as well as to private facilities. As I have said the atomic hazards problem is essentially the same regardless of who owns the reactor.

Seventh, a study should be made of the international liability problem and of various ways of dealing with it. I would be disturbed if such a study delayed legislation urgently needed on the domestic side. However, it might help to encourage sale of reactors abroad if any legislation enacted were broad enough to provide flexibility in dealing with the international problem.

These are some general ideas. I am confident that the insurance industry and many others will be willing to help in working out the details of the legislation.

In this testimony I have discussed a number of issues, particularly that of atomic liability, which will require careful thought and decisive action. I have done so without hesitation because through the years you have dealt with the issues courageously and wisely. The problems in this new field are not easy. They never are where opportunities are so great.

Representative HOLIFIELD. Thank you, Mr. McCune.

Representative COLE. Mr. Chairman, I don't know as I have any questions to ask of Mr. McCune. His discussion has been very complete. I do recall that on a previous occasion the committee has had

the benefit of his judgment and advice in this field, and I think on each of those occasions, he has pointed out the roadblock that is ahead in the program of the development of reactors from the standpoint of liability involved on the owner or operator of the reactor.

It is an obstacle that has been a cause of great concern to all of us, and I know it has been to him, and unfortunately the solution does not seem to be any more readily available today than it was 2 or 3 years ago, in our first thinking about this thing.

I not only share Mr. McCune's concern, but I can go further and express some degree of amazement that there is indicated at the present a willingness of nearly a quarter of a billion dollars worth of private capital to move into this operation at a time when the solution of the liability has not been fixed.

I of course recognize that that indication of a quarter of a billion dollars available of private resources is just on paper, and you are not in the stage of physical being yet. But the likelihood is that they will not be physically in being until this solution is found.

I would hope that this committee and the Congress might undertake an effort to find a solution and to resolve this uncertainty before we adjourn this session of Congress. The longer it is delayed, the longer the program is postponed, and we ourselves and the Congress and the committee will be guilty of contributing to that delay. I would not like to see that occur.

Now, Mr. McCune has now for the first time raised another matter of concern with respect to the full development of the atomic program. That is the absence of profit by those who are presently engaged and those who as he sees it might become engaged in it. Therefore, there is an absence of incentive.

I am a bit surprised, although I can see how the trend might have started at the beginning and the Commission called upon the larger companies that had personnel and laboratories and scientists and management people to operate these big reactors—they called upon them to manage the reactors for the Government at a little or no profit. I think the profit on one of them was fixed at exactly $1 a year. I don't know what the terms were of the General Electric management contract but apparently they were not too profitable.

These big American business concerns were prompted to supervise these large reactors from the standpoint of patriotism and national interest, and they recognized they were the only ones available in this Government or in this country, Government or otherwise, who had the capacity to run the industrial atomic plants. So they offered to do it, and I think it is to their everlasting credit that it was done. If the Government had gone out and hired the individual scientists and built the individual laboratories, and set up separately the administrative forces needed to operate these great plants, the success of the atomic program would not have advanced nearly to the point that it has today in my judgment.

Instead of having 6,000 employees on the Federal payroll directly involved in the atomic energy program, as is the case today, the Government would be employing something over 100,000 people on its payroll. That is just to operate what the atomic energy program would be as an industrial enterprise.

Now, what can be done to change that trend is beyond me. I don't understand, Mr. McCune, why it is that because you people had the

management contracts, and therefore had no direct profits from those management contracts that you are circumscribed in the same fashion with respect to the hardware that you make to go into these plants. Unless the Commission in its purchasing contracts with you insists on a right to supervise your costs or examine your cost accounts and refuses to give you any allowance for profit, or for an independent producer who supplies materials to you to put in some machinery—why, he would be limited in his profits.

What I am getting at, explain why it is that the generalization of patriotic motive which prompted you and the other big companies to manage these plants has become the pattern and the standard in determining the prices that are paid for atomic efforts other than management, if you can do that.

Mr. McCune. I will try to do that, Mr. Cole. As far as the purchase of standard components is concerned for plants which have been built, that has been done practically entirely on competitive bidding just the way it should be done, and I have no criticism of that whatever. The Atomic Energy Commission and others have not essentially made any policies of looking into peoples' operations so that the components would not carry a reasonable profit. I am not making that charge in any way. But these components that have been purchased in that manner are principally the components sold on the regular market. The return on those by businesses which might product pipe or elbows which go very heavily into these plants and material of that type is probably not at all looked upon by those businesses as a return on a specific investment in atomic-energy enterprises.

The major reactors in general, however, have been built in laboratories or by laboratories in the field, or at the plant, often principally by construction labor as you do in a field job, and almost entirely on a fee basis with a very small fee. I think it has been very small. Very few companies, as I see it, have had a chance to participate in that field on any kind of a profitable basis.

I am not criticizing the Commission there. I think it is the Commission's job to get the lowest price it can for the Government, or at least the Government looks at its job that way, and rightfully it should.

But the upshot of it is just as I have said here. The upshot of these wise policies or what would seem to be wise policies has been, I believe, that those businesses on whom we are dependent to carry on a substantial amount of the private financing necessary to build an atomic energy industry, have substantially no profit position in the background to be looked at, by their boards or their shareholders.

Representative Cole. What were the terms, for illustration, of the General Electric contract with the Commission with respect to the West Milton plant, where you not only built the plant, but you built the prototype reactor for the submarine *Sea Wolf*. Later on you built the reactor itself that went into or is going into the *Sea Wolf*. What do those contracts provide with respect to GE's compensation, if you can tell us without disclosing anything?

Mr. McCune. I can tell you. The principal source of funds for everything that the Knolls Atomic Laboratory has done and everything we have done at Hanford has been from the Commission, the Atomic Energy Commission. Our contract with the Atomic Energy Commission has been modified from time to time, but as of today it is

still the same basis that at the conclusion of the contract we will receive one dollar.

Representative COLE. That is General Electric's profit?

Mr. MCCUNE. That is our profit since 1946.

Representative COLE. For everything that GE has done?

Mr. MCCUNE. For everything that we have done for the Atomic Energy Commission at Hanford and KAPL. That is the Hanford and Knolls Atomic Laboratory.

Representative COLE. $1 a year?

Mr. MCCUNE. No, sir, $1.

Representative COLE. When you quit doing it for the Government, is that right?

Mr. MCCUNE. If we keep up enough years, $1 a year might amount to something, but as it happens, our contract is $1.

Representative COLE. The longer you work for the Commission, the less you are going to be paid for it.

Mr. MCCUNE. The less percentage of profit.

Representative COLE. The percentage of that dollar, yes.

Mr. MCCUNE. Some funds for the Navy work have come from the Navy. There has been procurement of things, ranging from procurement of just ordinary things that are bought on the market to very specialized things. Some of these purchase orders which are competitive business have had normal profits, and some have not, but of course we have supplied a very, very small percentage of the dollars which we have administered in the construction of Hanford or the construction of KAPL or West Milton or anything of that kind.

Representative COLE. You mean by that last statement that a very small expenditure of funds which GE has incurred in these projects for the Commission have been used to buy things which GE makes?

Mr. MCCUNE. That is right. Our general purchasing arrangement with the Commission is to the effect that we purchase items which are not manufactured by General Electric but if we need an item which is manufactured by General Electric, we may prepare specifications and the Government does the purchasing. We have always had that from the very beginning, or otherwise we might be criticized for what we had done. There is no preference as it stands for General Electric in the purchase of all of this equipment simply because we have operated it.

Representative COLE. During all of this time that you have been working for the Government adn the people of the country for nothing, you at the same time, I mean GE, has been learning how to make these specialized things that go into a reactor, and therefore you are in an advantageous position to profit by the manufacture of those things when they are purchased by persons other than Government.

Mr. MCCUNE. That I recognize, and in the interest of fairness in my statement here, I made that point, that there is a basic gain. However, maybe I should not belabor this point, but I think it is not a General Electric problem. I think it is an industry-Government problem. I think if one looks at the growth of the electronics business which has tremendous national significance, or of the aircraft gas turbine or jet engine business, you will find that the people participating have learned—in fact, they have not learned, but they have developed the business. They have from the very beginning produced it on a basis of earning as they went along the capital to put back into the

further development of the business, and I have pointed out that the atomic energy business essentially as it stands today does not have a backlog of industry which has earned as it went along the money to put back in the business. I said at the moment that is not deterring us, but in the event of a recession, and there have been recessions, many businesses I think will have to question very carefully this type of situation.

Representative COLE. I understand your position is that you are not complaining about the lack of profits, but you are pointing out the possibility that in the future, in the case of financial adversity, if that situation faces business in general, these atomic activities whch are not now profitable wlll be the first ones that will be curtailed or discontinued.

Mr. MCCUNE. It may well be.

Representative COLE. I would go even further than that, I don't know of any reason at all why the Government now should insist or expect private capital or private business to engage in these activities without any compensation. I don't know for the moment of any other activity where the Government makes contracts with other persons or corporations, even in the highly sensitive defense activities, of ballistic missiles and guided missiles and aircaft and all of that, where the Government does not expect that the company will be making a profit, and a fee will be charged to the Public Treasury to cover that. So that irrespective of the future, that particular aspect of recession is in the future, having a depressing, if not a curtailing effect on the atomic program—irrespective of that, it seems to me that the time is pretty close by when the Government should expect to pay a reasonable fee or profit to those that are doing the work for the Government.

I don't know what you can do about it, except when the Commission comes to you to make a contract, you can say, "Is there anything in it for us?" And then the Commission will have to report that back to the joint committee and to the Congress, and then we will all jump on your neck for being so greedy.

Mr. MCCUNE. I might say that in our case, we have negotiated almost to the conclusion, and agreement, a continuation of a contract which is not signed. What I have said here has no bearing on that agreement specifically, and it will have no bearing and there is no attempt to change any agreements previously reached. That I will guarantee. But I do believe in spite of the fact that as I say this is a difficult thing to bring up, it is well to think about the implications of it.

Representative COLE. You might not be in a position to answer the next question, and that is whether the Commission in all of its contracts with all of its suppliers or supervisors of these projects expects them to operate without profit.

Mr. MCCUNE. I do know that there are fees on many contracts, and fees are being paid by the Commission, and I should say in our aircraft nuclear propulsion job we are being paid a fee.

Representative COLE. You distinguish that from a profit.

Mr. MCCUNE. Well, in general the amount of such fees, or at least such as are known to me, are extremely small and after taxes leaves you nothing practically to put back into the development of the business.

Representative COLE. The figure you speak of is attached to just the one of constructing the submarine reactor?

Mr. MCCUNE. No, the aircraft. We have another contract under which we are developing an aircraft reactor, and that contract is one that we are being paid a fee on.

Representative COLE. On the submarine you are not?

Mr. MCCUNE. That is right, at the present time.

Representative COLE. I think that that is all I had in mind to ask.

Representative PATTERSON. Mr. McCune, there is only one thing that I wanted to refer to, and that is the fact that during these past 10 years I have had opportunity to talk to our engineers and our physicists and so forth about the various piles around the country, and I too was always concerned about a runaway pile. But I finally was led to believe that it is almost an impossibility, because of the controls and if one started to run away, it would be brought under control immediately.

That leads me up to this point of liability, as far as insurance is concerned. Again I feel that our Government should shoulder an insurance problem of liability with respect to our manufacturers in cases where atomic work is being done for the Government and an incident should happen. Again, it has been referred to that our Government would do that just from the past experience that we have had in my district during the devastating flood, when our Government came to our aid.

So I just have a feeling that there is a little too much concern with respect to insurance and liability in this atomic field. With the controls and the knowledge that our engineers have, I think it is rather remote that anything could happen to extend the devastation of an entire community or to any segment of the community.

I don't know how you feel on that other than the fact that you have stated here in your remarks that it is an unknown at the present time.

Mr. MCCUNE. I tried to cover that as best I could in my remarks. The probability does exist. It is a remote possibility, I agree with you heartily. The difficulty is that we are talking essentially about something which conceivably could be very large, and it is extremely difficult to measure, and it can in effect put you out of existence as a corporate entity if it did happen. It has been estimated that it could happen. There is practically no chance whatever of it happening. Insurance, as I see it, and I am not an insurance expert, covers something different. You insure an automobile accident, let us say, or against automobile accidents, and automobile accidents occur all of the time, unfortunately. You have a pretty good standard of measurement of what happens at automobile accidents, and you have thousands of them, and I suppose millions of them to check up on.

Here we are entering into an industry that does not even have a code of standards. I believe that insurance is of extreme importance here, because by and large the insurance industry in this country carries great responsibility for the safety of our enterprises. In many ways your insurance policy and your insurance examiners are your policemen, and this is good, and this is what we must come to. But the insurance industry in general is not on the basis of covering extremely large contingencies with almost no likelihood of their happening. They are concerned with covering what may be the individual's large, but to them relatively small, risks which happen all of

the time. That is like the life insurance, and everybody dies. That is why I refer to it as the liability problem as distinct from insurance, and it is a different problem.

I think in your statement as you went along, you were recognizing the difference between those, if I understood you correctly.

Representative COLE. I don't quite understand this $60 million insurance figure and how it would operate. Are you sufficiently familiar with that to tell me how it might protect me if I were to build a reactor?

Mr. MCCUNE. I have been fairly close, I believe, to the insurance situation. Of course, I cannot speak as an expert in this field. It is my understanding that the insurance companies, almost all of them, are prevented by law or otherwise from putting any more than a certain portion of their assets and a very small portion on a single risk, and in order to get a pool of this size——

Representative COLE. What do you mean by single risk?

Mr. MCCUNE. Well, they would not insure a single ship or a single reactor or single incident beyond a very small proportion of their total assets. Otherwise, they would be taking the chance of wiping out all of the other people who have paid them for insurance. So in order to put together a large pool, they had to work among themselves to see how much each one might put up within the rules and regulations. As they have announced, that $50 million or $60 million of liability might be available for an individual installation. But to date nothing has been said about when it will be available or what the premiums will be, and what the terms will be and what the nature of the policy is you might buy, and as you pointed out here, I am not clear as to anything else except the fact that the insurance companies have been putting a great deal of effort into this question. Many of the presidents of these companies have been personally working very hard on the job, and this is where we stand today.

Representative HOLIFIELD. Mr. McCune, you have spoken about the absence of profit in the atomic business. But of course the atomic development today is based or has been based upon a military product. That is the core of it, the production of uranium 235. The Government resorted to contracts with private industry in order to build this great industry. I think it is generally considered that in the $14 billion plus that has been used, it has been about on the order of $8 billion for masonry and machinery and physical things, and approximately $6 billion for salaries, services, and intangible contributions to the total industry.

Now it is my understanding that industry has participated as far as the $8 billion is concerned on a normal profit making basis by competitive bids, or negotiated bids which allowed them normal profits. Is that not so?

Mr. MCCUNE. I cannot give the relationship of the $8 billion to that portion of the business which was purchased at you might say market prices, but if $8 billion represents the so-called construction funds, I think a very small portion of that amount was material purchased and a great deal of it was labor to begin with, and of that material which was purchased undoubtedly just as you have said it involves such things as land and concrete and so forth, which has been purchased, let us say, on a normal market, but it is not encouragement for those concerns who in the end are going to have to make the decisions

as to how much of their capital structure they have earned and can earn in the future will be diverted to putting a base under this business. That was a long sentence.

Representative HOLIFIELD. All of the special equipment and we have been in these great plants, and we know that they are filled from floor to ceiling with pumps and valves and boilers and every type of industrial equipment that you can think of. That part of the $14 billion has been handled, I think, pretty well on the normal way of handling it in the United States and companies and individuals have made profits on that.

Mr. MCCUNE. That is right.

Representative HOLIFIELD. Now, you get to the $6 billion division for operations, it is true that contracts have been made with private business to operate these great plants like Hanford and Oak Ridge and other places, but then in those instances the management firms, whether it was General Electric, Monsanto Chemical, or Westinghouse, or whoever it might be, they were all given the privilege of building management groups and management forces which the Government paid all of their salaries, the overhead of those people was charged off to the Government, and the net result was that while you rendered a great services in doing this, the Government pretty well bore the expense of all of this, and now that the development has reached a point of possible commercial participation, those companies such as your own are in an advantageous position to obtain contracts to go into the commercial market. They are years ahead of the people who have not participated, is that not true?

Mr. MCCUNE. Well, there is no question, as I have said, that competence has been gained by companies such as ours in doing this job. As I said, that has been an incentive to continue in the business. But the point I am making is not a complaint. I stated that I think very clearly. I am simply calling your attention to something that I think is important, which is that in the development of most of our other basic industries as large as atomic industry is likely to be, they have developed from the very beginning on a basis of earning money and putting it back into the business in order to provide the ultimate facilities and the other facilities in order to make the thing grow.

Representative HOLIFIELD. I think that is true but by the very nature of this thing we felt this was a Government monopoly, and this was a halfway step away from complete Government operation, and I think it was a step well taken as far as I am personally concerned.

Mr. MCCUNE. I agree with you.

Representative HOLIFIELD. Now, we get to this question of liability. We recognize that the insurance companies of America are probably the largest financial institutions in America. They have tremendous reserves that they have built up over the years, and it puts them in the category of our greatest capital owning institutions. That is true even though they carry it in trust.

It seems a bit strange to me that these private enterprises who are so active in selling their policies on other things such as floods and earthquakes and typhoons and shipwreck and all of that sort of thing, that now they show a suddent lack of enthusiam in getting into this field. It causes me to wonder if these shrewd men have not figured the risk is too great for them and that is the reason they don't want to get into it.

Would that be a logical conclusion, to say that they feel that the risk is too great, or the catastrophic shock of one runaway reactor would be too great for their companies to survive financially?

Mr. McCUNE. Well, again I think that that is a question which might best be asked of the insurance industry.

Representative HOLIFIELD. Well, at least they haven't come forward and show a willingness. We were told when we passed this act that private enterprise was all ready to go, and all we had to do was to pass this act, and they were coming in and going to enthusiastically build up this great atomic industry.

Now you are telling us what a lot of us felt all along would be the case, that they were not ready to come in and take the risks of this uneconomic industry because it is an uneconomic industry, and we might as well face it at this time. So now we find out that this seems to be the drawback.

What other drawbacks are there? Assume the Government now takes over the function of private enterprise in guaranteeing you against industrial accident hazards—assuming it does that, what is the next thing that you are going to come in for? Are you going to come in for guaranteed long term contracts on plutonium at a stated price. Is that the next request that is going to come from private industry?

Mr. McCUNE. I can't speak about the next request that might come from private industry. As I have said, I think the most important problem today is the question of getting this liability situation settled. As far as the insurance companies are concerned, again I think that we must go back a little.

I think it is very true that our company, for example, has participated in this for a long, long time, and we think we possess certain competence and certain judgment. Look at it in the eyes of the insurance company where for many years by law practically everything that is involved here was Government property, and the Government has always insured itself. Hence, they were the segment of the American industrial economy that was not even called in on this to amount to anything. We used the railroads, and we used the manufacturers, and we used the construction industry, but we did not use the insurance industry. That is because the Government owned the plants, and the Government does not buy insurance. They have taken years and years to catch up.

Representative HOLIFIELD. The Government carries its own insurance on all Government buildings and all Government equipment, and they don't insure their battleships against loss and their submarines, as you well know.

Mr. McCUNE. I am not saying it is wrong. I am saying it has set up a situation in which one of the big major components of our own economy has had nothing whatever to do with the atomic energy picture, and they are working hard to overcome it, but you don't overcome that in a year. Yet they are willing I think to pick up a larger risk here.

Representative HOLIFIELD. The thing that worries me—we passed some legislation. If we do that taking the risk, and it then becomes a Government risk, it ceases to be a private industry risk, and so we are breaking over there.

Now, the next thing would be a 7 year or 10 year contract for plutonium at a certain price per gram regardless of whether efficiencies caused it to be produced twice as cheap, but that would be the next thing that industry will be asking for, in order that they can be assured that they are not only guaranteed against any catastrophic risk but that they are guaranteed against any financial risk. Then when does it become private enterprise, and when does it become Government enterprise?

Mr. McCune. I think that if as the price for putting any money into atomic energy they were to come and say they would not build laboratories, or they would not hire people or would not do any of these thing unless the Government were to give them a contract for a long term contract for plutonium for weapons—I think there really would be something sick about this program. But I don't believe industry has done that.

Representative Holifield. They have already done that. We have already give you a 7-year contract at a stated price for plutonium, I believe, or for uranium, at least. That is in the raw materials field, we have guaranteed to the refiners a subsidized price for 7 years to get them to go in and mine the material. I suppose the next thing would be to guarantee a subsidized price to the owners of reactors for their plutonium byproduct. So it is a sick industry from the standpoint of profit. It is not an economic industry. All of this sham and subterfuge seeks to place this thing on an economic basis and in my opinion is just deceiving the American people, because up to date there has been no evidence shown to me that production of kilowatts by atomic fission is competitive with conventional produced kilowatts.

Now, maybe it is necessary for us to subsidize this and charge it off to our race against the Soviets, I don't know. Is that what you are advocating?

Mr. McCune. I have not asked for any subsidy.

Representative Holifield. Do you say that when the Government insures a business which you want to go into, which private enterprise won't insure, that that isn't in the nature of a subsidy?

Mr. McCune. I said that if you deemed it wise, industry I think would be willing to pay the worth of that risk.

Senator Pastore. I did not get that.

Mr. McCune. I said I think industry, as I have said in the testimony, would be willing to pay the worth of that risk, so it would not be a subsidy.

Representative Holifield. Apparently the insurance part of the industry is not willing to shoulder the responsibility of charging a premium commensurate with what they think the risk is.

Mr. McCune. They have not yet determined the premiums, nor do I know what they will be. I think essentially that that traces back to the fact that, rather than having been associated with this as many other segments of the economy have been for 10 years, they are just being brought in 9 years late.

Representative Holifield. They haven't been planning on this for some time, and they haven't been studying this problem? I understood the insurance companies have been spending quite a bit of time and study on this for the past 2 or 3 years.

Mr. McCune. Well, since the new law was passed, and since access permits were available to them, I think that is correct.

Representative HOLIFIELD. Well, let us get away from the financial point and the responsibility of entering private enterprise as compared to that of the Government participation in this enterprise, and consider the human danger of placing these plants near great centers of population. If the risk is so great that the insurance companies refuse to write policies on it, do we not have another factor to consider, and that is the possible endangering of lives in these great centers? Isn't that something that should concern us?

Mr. MCCUNE. Well, if there were a major chance of a large segment of some site being destroyed or something of that kind, I should say that it would be absurd to go ahead with this. On the other hand, let me say this——

Representative HOLIFIELD. The insurance companies believe it or they would write policies on it, and we can't have it both ways. There is either a risk, as the insurance companies denote by their actions that they don't want to take, or there is not a risk. Now, if there is a risk, it is not only the financial risk, but it is the risk to a city of 5 million or 6 million people where it is located in the vicinity of one of these giant reactors.

Mr. MCCUNE. You must recognze, and I am sure you do, that for example, Hanford reactors are far more dangerous than any of the reactors that I know of that are being proposed for industrial use.

Representative HOLIFIELD. Yes; I know that.

Mr. MCCUNE. We have given no thought to working around those reactors, and I am not afraid of my life, not because I have any particular courage, but just because it is absurd.

Representative HOLIFIELD. I share your same feeling.

Mr. MCCUNE. I feel I am safer when I am working in those buildings than when I am going downstairs. This is testified to every day by the actions of thousands of people. But there is still, according to the very best data that I think you can put together, a possibility of this magnitude that I am speaking of, and let me say I dont know how you measure lives in dollars. You certainly can't measure them in the same terms but any way you look at it, it is principally property and not people. What we are thinking of is not an explosion, but something that happens relatively slowly.

Representative HOLIFIELD. And will contaminate a considerable area around the reactor.

Mr. MCCUNE. And you would have an opportunity to tell people to get out.

Representative HOLIFIELD. Don't you think it would be a good idea, then, as long as there is this possibility, to lower the risk of financial and human danger, and to have these reactors out 50 or 75 miles from these big cities instead of right near them?

Mr. MCCUNE. Well, I think that you should put them a sufficient distance away so that you minimize the problem, and I think that is, in general, being done.

Representative HOLIFIELD. We are not doing that in the Shippingport reactor, are we? We are putting it pretty close in; aren't we?

Mr. MCCUNE. Well, I could not answer that question.

Representative PATTERSON. Well, isn't the danger most real from waste materials rather than from an explosion?

Mr. McCUNE. I am not talking of an explosion or a blast or an atomic bomb or any action of that kind. It takes a great deal of ingenuity to make an atomic bomb.

Representative PATTERSON. That is what I was thinking of.

Mr. McCUNE. We are not talking about a catastrophic, instantaneous explosion.

Representative PATTERSON. What do you visualize is the real danger? Is it handling of the waste materials and disposing of it, or what?

Mr. McCUNE. Well, this is a complicated problem. I think probably the only way to make it simple and still be relatively precise is to say that the failure of a series of things, each one designed as best you can, would be required before you get trouble. Trouble, if it came, is likely to be a melting down, a slow melting down and vaporizing of some of the material which contains fission products and hence is radioactive.

Representative PATTERSON. One that could not be controlled once it started?

Mr. McCUNE. Not being brought under control; that is correct. For example, in the reactor that we are proposing for the Commonwealth Edison, for that reason, we are surrounding it in a pressure vessel which would contain any such things. The pressure vessel would be calculated with substantial factors of safety. We then say it is impossible, and that happens to be a very safe type of reactor. But it was impossible for the *Titanic* to sink, people thought.

Senator PASTORE. Mr. McCune, are you saying that, unless an answer is found to this insurance problem, that is the one big obstacle that might retard the progress that we all desire in the development of the atom for power production?

Mr. McCUNE. I believe exactly what you said.

Senator PASTORE. And do you feel, because of a lack of interest on the part of the insurance companies just as to what this unknown may be—definitely it is an unknown—that we must have Government participation in order to insure this progress that we are talking about?

Mr. McCUNE. I don't believe it is lack of interest in the insurance group.

Senator PASTORE. I did not say lack of interest. I am not saying that. We are talking here about an unknown, and definitely there is an unknown, and we haven't had the experience in this particular field. It is a new field. Up to this time it has all been conducted by Government; is that right?

Mr. McCUNE. That is right.

Senator PASTORE. Now, you feel that private industry might be somewhat hesitant to go forward with this program unless there is some safeguard as to what their liabilities might be, in the case of an incident. You call it an incident, or it may be an accident or anything.

Mr. McCUNE. Yes, sir.

Senator PASTORE. You still see this as absolute liability because of the hazards that we are dealing with?

Mr. McCUNE. Yes.

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Senator PASTORE. Now, is it your firm conviction that, unless some answer is found to this insurance problem, that might be the obstacle to the proper development of this field?

Mr. MCCUNE. That is exactly what I believe.

Senator PASTORE. Have you any ideas as to how this should be done, and how this problem or obstacle can be surmounted?

Mr. MCCUNE. I feel that the best thinking that I have would be that the Government should see that a reasonable amount of insurance is available to anyone that it allows to go ahead with a reactor. This establishes the ultimate base for the policing of the industry, as I see it, and then beyond that I think the thing that is necessary would be recognizing full well that the Government has control over the design and has control over operating procedures, and it has the licensing of operators, then that the Government might grant a liability, not an insurance, but grant a liability protection, and either in its wisdom ask that industry in addition to a reasonable insurance premium which industry has to negotiate, pay the Government for that, or not? Now, the reason I say that "or not" is that actually I think we are talking about an eventuality which might, let us say, if you pick figures out of the air—suppose we were talking about $500 million of damage, which would wipe out almost any company in the United States—the chances are probably at least a million to one against that happening——

Senator PASTORE. Let me say this to you, Mr. McCune.

Mr. MCCUNE. Which means the actuarial value of this thing is $500 a year. But those figures may be very substantially off, perhaps it is $1,000 a year, but it is a small actuarial likelihood of a substantial amount.

Senator PASTORE. Are you in fact saying, Mr. McCune, that unless an answer is found to this big problem of insurance, and let us call it insurance for the time being, that unless an answer is found to that big problem that we are not going to see too much progress made in this field by private industry participation?

Mr. MCCUNE. I believe that.

Senator PASTORE. Would you say that at least this becomes all of the more necessary in the research stage?

Mr. MCCUNE. I don't believe this will be needed for any length of time.

Senator PASTORE. You mean when the insurance companies actually see what can be done, and the practice and experience is such that this can be reduced to trade terms as liability, and there won't be so much to fear at that time? But as of the moment, it is pretty hard to get people to talk on cases, because no one seems to know what the consequences might be.

Mr. MCCUNE. We will have proven codes, and we will have proven standards, and I would hope that we will have many reactor years of operation which we don't have at the present time, and we will have many things of this kind on which to base our future judgments, none of which exists now.

Senator PASTORE. Like yourself, Mr. McCune, I am not kidding myself about this at all. I have sensed right along a hesitation or reluctance on the part of private industry. I can't put my finger on it, what the real reasons for it are, I don't know, but it might well be that chances are we don't need this vast amount of additional electric

current for the moment, and for that reason private industry maybe is not too much interested. It might well be that chances are because it is not commercially economical, that may be another reason, but I mean beyond all of that I think that there is a feeling on the part of private industry, and we had quite a discussion here at the last meeting that they would like to do all they could in this particular field if they only know where they were going.

I have sensed right along, like yourself, that this insurance problem is a big obstacle. I was refreshed by one member on the other side. He introduced a bill which has something to do, and I am not familiar with the terms of this, but it has something to do with Government participation, and I go along with you that unless some answer is found to that, the chances are this whole matter will go down considerably.

Your testimony here this afternoon is that you take the position that unless the Government plays a part in this insurance aspect, we are going to see this whole program slowed down, am I right?

Mr. McCune. I think that we will.

Senator Pastore. Are there any other questions?

We thank you very, very much, sir.

Mr. McCune. Thank you.

Senator Pastore. The next witness is Dr. James Beckerley.

STATEMENT OF DR. JAMES G. BECKERLEY, SCHLUMBERGER WELL SURVEYING CORP., HOUSTON, TEX.

Dr. Beckerley. I should like to confine my formal remarks to two sections of the McKinney Panel Report, namely, the section on controlled thermonuclear power, chapter 3, and that concerned with control of information, chapter 11. In addition, I should like to comment briefly on other sections of the report. The remarks will represent my views as an individual.

If, in the following, my comments appear critical it should be noted that I am only discussing a very limited part of the report. The task of the McKinney Panel was most difficult and most important. There is no doubt that, as a whole, the findings are sound and that the substantial background material presented for public consideration will be extremely useful to many citizens as well as to the Atomic Energy Commission and the Congress.

The McKinney Panel findings, with respect to the thermonuclear reactor project, are somewhat puzzling. It is referred to as a "truly frontier research project" and as one in which there are "many basic problems still to be resolved before there can be any assurance of success." Yet the panel refers to permitting the maximum interplay of scientific and engineering ideas "within the limitations which national security considerations impose."

This is, I believe, the first time in the United States when, during peacetime, a pioneerig fundamental research project has been labeled as having "national security considerations."

The AEC, in the Chairman's letter of October 12, 1955, to Senator Anderson, has advanced as the basis for control of information concerning the project the fact that if a controlled thermonuclear reactor becomes feasible it "will be a substantial neutron producer capable of producing substantial quantities of special nuclear material." The

panel, in its comments, is somewhat less euphemistic in referring to the "production of fissionable materials through the irradiation of such fuel materials as uranium and thorium."

It seems extremely strange that the McKinney Panel is reluctant to recommend release of information on a neutron-producing device which no one knows how to make, and which may never even be possible to make, when at the same time the panel recommends release of reactor technology information. For some reason the panel seems to be more disturbed about neutrons produced from fusion than about neutrons produced from fission. For some reason the neutron-producing capabilities of unknown devices are feared more than the demonstrated neutron-producing capabilities of fission reactors.

The position the panel has taken on this important question appears to be technically unsound. It is known that neutrons can be produced in quantity from the fission process. It is known that the natural resources of fissionable material are vast, that the more fissionable material is sought the more it is found.

Because of these facts, I submit that even if a controlled thermonuclear reactor is proved to be feasible, it must still be viewed simply as a competitor to fission reactors. It is quite conceivable that the extraction of useful energy and neutrons from the fusion process may be so expensive that it would be cheaper, for example, to extract uranium from granite for neutron and energy production. There is no doubt, of course, that we live in a world where there is a much greater abundance of fusionable material than fissionable material. However, the significance of this ratio of abundance probably will not become important until perhaps generations from now.

There is another aspect of the thermonuclear power chapter in the McKinney panel report which troubles me greatly. The panel has asked the Commission to "permit the maximum interplay of scientific and engineering ideas." Yet nowhere is there any positive recommendation for public dissemination of information on this project, although it is clear that publication is the only practical way to assure such interplay of ideas.

The panel rather vaguely recommends that the Commission "develop procedures by which more people can contribute to the controlled thermonuclear program in the United States." Just what is the nature of these procedures? Liberalization of the access agreements? Bringing more people "under the tent"? Reduction of clearance requirements or security safeguards?

What the panel seems to have recommended could be paraphrased as follows: "Here is a truly frontier research project not aimed at producing weapons or military devices but simply energy. Because success may permit construction of devices for producing neutrons, and because the neutron is in the private and special domain of the AEC, we believe that the Commission should continue to monopolize the field. In the superior ability of the Commission to predict where ideas will be generated, we have great faith. Not only should the Government be given exclusive right to explore the boundaries of this frontier project but it should pay for and it should clear every individual who is engaged in the pioneering effort." This is in effect what the panel has recommended, even though it does bend a little in the direction of recommending relaxation of present information-control practices.

Continuation of the present situation seems to me to establish an extremely debatable precedent. The support of basic research by the Federal Government is, of course, an important and necessary activity. The monopoly of an entirely new area of basic study by an agency of the Government and the effective denial to scientists and engineers of the right to work, or even to think, in this field is not a proper function of the Government except possibly during the extreme situation of war or imminent war. Even in this latter situation the Government's control of basic research efforts, if exercised, should be extended to much more than a single, isolated area of science.

It might be considered that I am overstating the case by alleging that the AEC effectively excludes individuals from working or thinking in this field. I should like to point out that any graduate student working for an advanced degree in the physical sciences in the United States would probably never be permitted to work in this field unless he were a direct employee of a relevant AEC project. His mentor certainly would not permit thermonuclear reactor research since he would realize that any research in this field might be duplicating that which had already been done in secret AEC projects. Also he might be concerned about violating the Atomic Energy Act. Likewise, an industrial firm would be foolish to expend its funds or manpower in any nongovernmental work on controlled thermonuclear reactors. Both the individual graduate student or the industrial firm would be forced to tie up with the AEC by contract or access agreement. Independent work, independent studies, would be essentially impossible. Even some of the normal incentives to develop new ideas would be absent. A patent application, upon filing, might be placed under secrecy order and thereby rendered useless in commercial competition.

All one has to do is consider a few hypothetical cases to realize that the only efforts to solve this truly frontier research problem are those supported by the AEC and by personnel approved by the AEC. Actually, these efforts are, I believe, much too small for such a long-range, difficult, and fundamental project. Moreover, it is certainly debatable for an agency of the Federal Government to pre-empt an entire area of fundamental research, expecially when the reasons advanced for the construction of the monopoly are based on questionable logic.

Perhaps it would be helpful to the Committee if I were to refer to some specific instances from my experience as AEC Director of Classification. I will be rather vague as the AEC has released little information on this project and I do not wish to offend. I recall a time when there was an individual who had a very interesting idea on an approach to the thermonuclear reactor problem. He had a Q clearance so that he was reasonably well-informed, although I am not certain whether at the time the idea was conceived he was completely informed on the thermonuclear project. The idea was reduced to writing and, of course, appropriately classified. As I recall the situation, the individual would have liked to have conducted work on the idea at his university. However, if such work had to be classified, it would have been almost impossible. Had he been able to discuss his ideas with some of his brighter young graduate students, and had be been able to encourage them to conduct doctoral research in this area, then he might have been able to develop something really useful. As it was, the idea was put in writing, classified, circulated to interested parties

and, so far as I know—and I may be completely wrong—the idea has died in the Commission files.

In any event, even if the idea has not died, its development was certainly enormously handicapped.

Senator PASTORE. How would you have handled that?

Dr. BECKERLEY. Well, under the situation there, as long as the Commission had kept this area classified, it was impossible, of course, to go along with his idea of conducting the work on a nonclassified basis at the university. I think that the proper solution—which I will come to later—would have been to declassify the entire area. I will advance more reasons in the discussion later. This is a very difficult question.

Senator PASTORE. The reason why I say that is that all of us can find fault and sometimes it is another matter to suggest a solution.

Dr. BECKERLEY. I think the fault is quite basic here, and one really has to go down to the bottom of the situation.

Senator PASTORE. All right, sir.

Dr. BECKERLEY. I am not criticizing the Commission's action there, except insofar as the classification was concerned.

Senator PASTORE. I was curious to find out if you had a suggestion.

Dr. BECKERLEY. In connection with this incident I should like to remind the committee that there is ample evidence in the history of science that the best ideas, the real breakthroughs, come from the minds of the younger scientific workers. Moreover, it is seldom that they are engaged in classified work. Under the present Commission practice of maintaining secrecy and restricting the work to a relatively few places, the immense reservoir of young men and women in the universities of this country are not even permitted to generate ideas in this truly frontier research activity. If anything ever did develop, we would not even have the trained manpower to support a large effort.

It is not clear from the AEC statement, submitted with the background material of the McKinney Paney report, whether the Commission's decision to keep thermonuclear reactor data classified is based on the considered judgment of all the scientific community under the AEC aegis.

I might interpolate here that I recognize it is not customary to ask all of the scientific community for comments on a particular declassification action. However, in this case, the problem appears to me to be of quite a different order of magnitude from the normal problems which one faces in declassification action.

I recall several years ago placing the question of declassification before a large group of scientists associated with this project. All but 1 or 2 of a group of more than 50 believed that all work performed up to that time should be declassified. Had the views of this group been unanimous I suspect it might have been possible to convince the Commission that the project should be declassified.

In retrospect, I regret that the proposal to declassify was not pushed at that time. Declassification certainly would have resulted in a strengthening of our national effort in this field, probably in the same manner that the release of nuclear reactor data has clearly strengthened our national effort in the fission power field.

Unfortunately I was unable at that time to secure the necessary strong staff and scientific support for such declassification action and

nothing was done about it. Shortly afterward the change in the Commission chairmanship made the task of justifying declassification in this field essentially impossible.

To return to the panel report, it must be admitted that the controlled thermonuclear reactor project was not a primary subject for panel consideration. The present impact of the project is essentially nil. The panel was quite correct in devoting less than four pages to the project.

Before leaving the thermonuclear power chapter of the McKinney panel report, it is only fair to point out that perhaps the panel considered the present world situation to be tantamount to "imminent war." In one sentence the report states:

> As private citizens, we would hope that the day will come when world conditions will permit all those able to contribute to thermonuclear power to learn all there is to know about it.

This seems to imply that current world conditions are such that any "frontier research" with possible future practical applications should be sequestered. However, if this position is adopted, then it must be supported across the boards. Who can say that this is the only frontier research project possibly leading to new "Pandora's boxes"? Why not classify all high energy physics because of the not inconceivable possibility that some of the new particles will open the way to production of nuclear species even more amendable to nuclear energy extraction? Why knows whether the results of advanced research in physical chemistry will make possible the separation of uranium isotopes by "kitchen sink" techniques?

The future is full of fears or full of hopes, depending in large part on one's attitude. In chapter 3 of this report the members of the McKinney panel appear to have been pessimistic in supporting, albeit not wholeheartedly, continued AEC control of thermonuclear power information. This attitude is, I believe, not quite consistent with other chapters in the report.

From the fact that declassification of fission reactor work provided an enormous stimulus to activity in this field, it would have been more logical to conclude that the thermonuclear power project should be completely declassified.

You will recall my appearance before this committee in February of last year. At that time I advocated the amendment of section 11 (r) of the Atomic Energy Act of 1954 to exclude from restricted data items (2) and (3), the production of special nuclear material and its use in the production of energy.

It is gratifying to note that the McKinney panel essentially recommends the same action. Certainly, if only information on the design, manufacture, or use of atomic weapons is to be "born classified," then section 11 (r) must be amended as noted.

The panel's recommendation that military applications of reactor technology be protected is reasonable. However, it is essential that military applications include the barest minimum of research and development data. Otherwise, for example, information concerning uranium metallurgy studies conducted in support of nuclear-propelled military aircraft will wind up classified as defense information even though the information may be very useful in civilian power-reactor development. Unless the scope of military reactor technology to be kept classified is carefully circumscribed, implementing the panel

recommendation may result in reduced effectiveness of industrial participation.

The panel's recommendation on collation of information is sound. Unfortunately, many of the reports have "died" before collation or declassification and only a cheap but decent burial in Government archives seems appropriate.

I was surprised that the panel did not recommend more specific interim action. Obviously implementation of the first recommendation "that the Commission remove all reactor technology from the restricted data category * * *" will probably require amendment of the act. Such action by the Commission if undertaken, would be tantamount to amending section 11 (r). In the interim before the act is amended, what should be done?

May I repeat two of my suggestions of last year, namely, that the AEC (1) declassify data on certain contributing industrial activities and (2) prepare a public report, primarily for scientists and engineers, describing in detail the technical nature of what categories of nonweapons information is presently held classified.

The AEC has accomplished a substantial part of the first item. Nevertheless, it is my understanding from review of the literature that the AEC is still holding all but the oldest, obsolete data on heavy water production technology. If so, it must be presumed that the AEC does not have confidence in private competitive efforts in this area.

As far as the public report is concerned, this seems essential. It should not be necessary to secure an access permit just to identify, with reasonable accuracy, what is presently withheld from publication by the AEC. Actually, the panel recommendation 3 of chapter 12 is similar to that made here, although they consider that such a report might be classified.

The recommendations of the McKinney panel on information controls appear to be quite sound. Except for lacking specific recommendations for the period between now and the time of amending the act to reduce the scope of restricted data, the panel recommendations are valid and should be acted on at an early date.

There are a few other short comments I should like to make. Chapter 13 on Manpower: Education of the Public and the Individual does not note the shortcomings of the AEC in its public relations. In chapter 10 there is, however, some implied criticism. The almost complete absence of direct contact between AEC staff and press is a handicap to accurate public reporting of peacetime uses of atomic energy. One suspects that the Commission tolerates the myth of being a supersensitive agency in order to avoid the embarrassment of facing searching questions by the press.

Perhaps the panel did not feel it appropriate to comment on the well-known insulation of the AEC from the press. If so, it is unfortunate, as it seems clear that the AEC, as the agent of the Government responsible for peacetime atomic energy development, has failed to maintain the proper public contacts.

As an example, one may note with dismay, the fact that the AEC did not comment publicly on the thermonuclear power project until forced to do so at Geneva. Then one is also discouraged to note that when stories on this project in the responsible press, for example, in the New York Times, mistakenly implied a technical relationship to

classified H-bomb work, the Commission was customarily silent. To my knowledge they have never scotched this myth.

Another aspect of the AEC's deficiencies in public contacts does not seem to have been noted by the panel. This is the continued "No Visitors Allowed" in many reactor facilities. To my knowledge there has been no public showing of the PWR, although at Geneva substantial written information and photographs were released.

AEC-sponsored public tours of peacetime atomic-power facilities are still too rare, even though as the panel notes in many places, the AEC is the central Federal agency in the development, production, and regulation of the peaceful uses of atomic energy. In defense of the AEC, it should be noted that they have made substantial and effective efforts in public exhibits. However, the day-to-day accessibility of the AEC to public scrutiny is hardly consistent with its substantial peacetime responsibilities.

I believe the panel could have supported a strong recommendation for a more enlightened public relations attitude on the part of the AEC.

Lest I be misunderstood in criticizing these secondary omissions, let me reemphasize that I believe the McKinney panel has performed a substantial public service and deserves the thanks of all of us. The recommendations are, on the whole, basically sound.

Senator PASTORE. Are there any questions?

If not, thank you very much, sir.

Dr. BECKERLEY. Thank you, gentlemen.

Senator PASTORE. Our next witness is Mr. John Menke.

STATEMENT OF JOHN MENKE, PRESIDENT, NUCLEAR DEVELOPMENT CORPORATION OF AMERICA, WHITE PLAINS, N. Y.

Mr. MENKE. I appreciate the opportunity of appearing before you again.

Senator PASTORE. We are very glad to have you, sir.

Mr. MENKE. I will identify myself first.

My name is John Menke. I am president of Nuclear Development Corporation of America, which is a modest-sized private company organized for a profit, located in White Plains, N. Y. The single-minded purpose of our company, which we call NDA, is to invent, design, develop, build, and sell the very best nuclear reactors that we can; this has been our aim since NDA was founded in 1948. I would like to speak with you today about a subject which I am beginning to learn a little about: The impact of the growth of atomic energy on reactor companies of modest size.

A difficult dilemma is often posed for the Atomic Energy Commission and its contracting officers by the vigorous competition between large and modest-sized companies. The dilemma is more difficult because of the very large, single-unit costs for reactors and their development.

On the one hand, the large corporations can make substantial dollar contributions from their diverse businesses, can accept large dollar risks and take losses, can provide large facilities and have large staffs. These big companies do make important contributions, although sometimes (with the larger staffs needing longer times for education) they may tend to move rather slowly.

On the other hand, companies that are modest sized at present may have large accumulated specialized experience and background with an integrated competence. They may have a distinct orginality, and they are usually characterized by a capability for speed which has much importance when the lead time of the United States is kept in mind. It must not be forgoten that these modest-sized companies, along with the big companies, also make important contributions to the progress and strength of the United States.

The judgment required of the Atomic Energy Commission and of its contracting officers in awarding contracts, and in placing Government facilities, is a vary difficult one. Their dilemma needs to be recognized, and it is recognized in the panel report (p. 14). Ordinarily, the very tangible and immediate dollar advantages overshadow the more subtle but sometimes more important and long-term advantages of originality, specialization, and speed. The choice is difficult and the responsibility is very great; continued guidance from your committee and perhaps some further guidance in the law would be useful.

I have no easy solution. One suggestion that I might offer is that a mixed policy, with a hard try at an even-handed balance, be adopted. At present there is, it seems to me, a strong tendency to lean toward the larger companies and the dollar advantages. I might depart from my prepared testimony for a moment here, and say that we are now at the point where you are determining the pattern of an important new industry. You are determining it in the same way or in a similar way to the determination of an industry when route patterns or franchises are granted. It will get less flexible, and less easy to influence as we grow older.

For instance, to give you an idea of how concrete this determination can be today, the subject of facilities is important. I know of a few instances and these run to many extremes. In some cases the Commission has granted use and access to facilities to private contractors in amounts of $20 and $30 million. In other cases they have negotiated contracts where the contractor has provided all of the facilities. I think if you were to look into the smaller companies, you would find a surprising relationship, that the more modest companies have fared rather more poorly in the total allocation of facilities than have the larger well-established companies.

For my own company, I know this number; the total amount of Government facilities that we employ is about $40,000 (AEC facilities are about $25,000), compared with approximately $1,750,000 that we have provided from our own funds.

Another important policy for you to consider is similar to one that has already been stated by the Defense Department, that the companies that originate and do the development should build the first units. After the first units, price competition, of course, must govern.

Once before, before you, I recommended a third policy, which has, I think, largely been put into effect, that research and development, per se, not be subject for competitive price bidding.

Since the AEC and the Defense Departments are still providing a very considerable part of the total revenue and source of facilities in this business, such balanced policies will tend to prevent fostering monopoly in the reactor business. Moreover, this is the crucial time

for such considerations, as the growth process is still fluid and still strong. All is not yet finished in inventing reactors.

The impact of the growth of atomic energy on industry should not only be to make the larger companies bigger. Now is the time to guide its growth and to foster vigorous progress and competition which the newer, modest companies will always supply in our country.

Thank you for your courtesy in inviting me to appear before you again.

Senator PASTORE. Are there any questions?

Representative COLE. Well, let me be the first to express the great admiration I have always had personally for Mr. Menke and his small company. I am curious to learn the success which your company has had since we saw you last. Is my recollection correct when it tells me that your organization was assigned a very important research and development contract by one of the big utility groups?

Mr. MENKE. Yes, your recollection is correct.

Representative COLE. Tell me which one that is.

Mr. MENKE. We are and have been nuclear engineers for the Detroit Edison Co. and its associates in the design of a fast breeder reactor.

Representative COLE. And that is the group of Mr. Cisler?

Mr. MENKE. Yes, sir.

Representative COLE. And your organization has been selected by that group to design and build?

Mr. MENKE. No, we have been simply nuclear engineers, and we have done only the out-of-ordinary engineering and design, the nuclear design of that program.

Representative COLE. You mean that somebody else will construct the reactor, according to your design?

Mr. MENKE. There are at least 30 companies contributing to that project who have made important contributions; and we have made one contribution; a great many other companies have contributed.

Representative COLE. You are not the sole nuclear engineers?

Mr. MENKE. I think we are the sole nuclear engineers but there is much other engineering to be done, and I would not want you to think that ours is the overweening part of the design. It is not.

Representative COLE. What other participations have you in the atomic program?

Mr. MENKE. I feel that our company has made a number of contributions to the atomic program. First it is in the design of research reactors, and second, in the design of aircraft nuclear propulsion reactors. I think that our contribution has been and could be quite large. And third, in the design of powerplants, both small and large.

Representative COLE. You spoke in your statement about the likelihood that small concerns while they don't have the large number of personnel in their group might have a quality of personnel which would greatly offset the larger number of less competent persons. Tell me again how large an organization yours is.

Mr. MENKE. Our company is approximately 200 people of whom approximately 60 percent are technical.

Representative COLE. They are scientists.

Mr. MENKE. Yes.

Representative COLE. What are the other 40 percent?

Mr. MENKE. Machinists and draftsmen and computers and secretaries and bookkeepers and so on.

Representative COLE. Thank you.

Senator PASTORE. If that is all, thank you very much, Mr. Menke. I think that concludes our list of witnesses.

I want to take this occasion to thank Dr. Libby and members of his staff for their attendance here today.

I have been asked to announce that the hearings will continue tomorrow in room 457, Senate Office Building. That will be 10 tomorrow morning.

(Thereupon, at 4 p. m., Monday, March 5, 1956, the hearing was recessed, to reconvene Tuesday, March 6, 1956, at 10 a. m.)

DEVELOPMENT, GROWTH, AND STATE OF THE ATOMIC ENERGY INDUSTRY

TUESDAY, MARCH 6, 1956

CONGRESS OF THE UNITED STATES,
JOINT COMMITTEE ON ATOMIC ENERGY,
Washington, D. C.

The joint committee met at 10 a. m., pursuant to adjournment, in the Old Supreme Court Chamber of the Capitol, Senater Clinton P. Anderson (chairman of the joint committee) presiding.

Present: Senators Anderson (presiding), Pastore, and Bricker, and Representative Cole.

Chairman ANDERSON. The committee will come to order.

STATEMENT OF BENJAMIN C. SIGAL, GENERAL COUNSEL, INTERNATIONAL UNION OF ELECTRICAL, RADIO AND MACHINE WORKERS, AFL–CIO

Mr. SIGAL. Mr. Chairman, I greatly appreciate the opportunity afforded me by this committee to appear before it at this time, on behalf of International Union of Electrical, Radio, and Machine Workers, AFL–CIO, to make a statement concerning the report of the McKinney panel on the Impact of Peaceful Uses of Atomic Energy. I am general counsel of that organization.

From the time it came into existence in November 1949, International Union of Electrical, Radio, and Machine Workers, AFL–CIO, also known as IUE, has taken an active interest in problems relating to the production and use of atomic energy. It represents employees who work in atomic energy laboratories, as well as employees who manufacture the innumerable electronic devices essential to the production of atomic energy. IUE is vitally concerned with the social, economic, political, and international aspects of the entire atomic-energy problem.

In our opinion, the impact report of the McKinney panel comes at a crucial juncture, both in world affairs and in the development of the domestic nuclear reactor program. We are deeply interested therefore in considering, shall we say, the impact of the impact report.

Generally speaking, we believe the McKinney panel has carried out its monumental assignment very successfully. We are in agreement with a substantial part of its report. However, there are several aspects of the general problem to which we believe the panel has not addressed itself with sufficient force. I propose to devote this statement to the panel's recommendations on atomic power, and related considerations. That is not to say that we don't have some difference

of opinion on some other matters, but this is what we want to emphasize in our statement today.

The recommendations of the panel on atomic power declare:

1. That the Congress, the American people, and the people of the world recognize that large sums of money and years of effort must be spent to bring atomic power to a point where it can be used effectively and widely on a competitive basis; unless and until research and development demonstrate that atomic power can be economically feasible, there can be no substantial impact;

2. That, in the event that industry does not take on the full risks and burdens, the Commission should support a program to bring atomic power to a point where it can be used effectively and widely on a competitive basis, even to the construction with public funds of one full-scale "demonstration" plant of each major reactor size and type;

3. That the urgency associated with this program requires that the technological resources of atomic power be fully explored with high priority; and

4. That atomic power be exploited as a source of electric power at a rate consistent with sound technological, economic, and public-policy considerations.

In an apparent effort to arrive at a consensus on the problem of atomic power, the panel has avoided a resolution of the crucial issues. The recommendations create more questions than they answer. Some of the questions may be stated as follows:

1. The panel states that much time and effort will be required to make atomic power competitive, and that there will be no substantial impact until such power is economically feasible. The panel does not clearly define its use of the term "competitive" or "feasible." For whom, and where, must atomic power be feasible and competitive?

2. The panel states that the Commission should support its own program of plant construction if industry does not take on the full risk and burdens. The question raised and left unanswered is whether or not industry has established its willingness to take on the full risks and burdens in the immediate future.

Chairman ANDERSON. Do you intend to develop that point later on?

Mr. SIGAL. Yes, sir.

3. The panel says that the technological resource of atomic power should be explored with high priority, but that it should be exploited as a source of electric power at a rate consistent with sound technological, economic, and public considerations. Why the difference in priority between exploration and exploitation?

The basic issues are crystallized by the position, on the one hand, of the majority of the Commission, and on the other hand by the position of Commissioner Thomas Murray.

Commissioner Murray recommended the following policy to this committee, on February 23, 1956:

1. That we adopt and adhere to a policy which recognizes that the establishment of a commanding lead in the atomic power race is a matter of urgent importance to the United States;

2. That as the first phase of a program to implement this policy we plan to install at home and abroad, between now and 1960, power reactors capable of generating 2 million kilowatts; that we further establish, as the goal of the second phase of our reactor program, 10 million kilowatts to be installed at home and abroad between 1960 and 1965;

3. That primary responsibility for financing the first phase of this program be assumed by Government; and that the matter of financing the second phase be left for later decision;

4. That the Commission continue its present efforts under the power demonstration program.

Mr. Murray pointed out that we do not have a basis in experience, even today, for estimating costs of nuclear power, that we can obtain

reliable cost data only by actually building and operating power reactors, and that the national interest urgently demands industrial atomic power with all possible speed. He pointed out that the United States is off to a slow start in the race for atomic power, and we are running with the field when we ought to be well out in front. Mr. Murray declared:

> The question is, Can the concrete task in front of us in the atomic power field be satisfactorily performed by private industry alone, or with limited assistance from the Government? It cannot. Not only is the cost too high and the time schedule too short; the immediate incentive that would make for the requisite urgency is presently lacking.

The Atomic Energy Commission, on the other hand, takes a much more relaxed view. The view of the Commission is that the economics of atomic power are of greater importance than getting the job done at an early date. The Commission has declared that it would be premature to decide at this time to construct with public funds a full-scale plant of each of the major reactor types. The Commission has failed to indicate any need or recognition that the United States should maintain a lead in the atomic power race, or that the international aspects of the problem are significant in the determination of its policy on this matter.

It is the view of IUE that the position of Commissioner Murray is thoroughly sound and should be vigorously supported. Inasmuch as the bill submitted by Senator Gore, S. 2725, authorizing and directing the construction by the Atomic Energy Commission of six nuclear power facilities for the production of electric power follows in principle the approach of Commissioner Murray, IUE urges that quick and favorable action be taken on Senator Gore's bill.

As we view it, the problem breaks down into two major parts: (1) what is the need for immediate nuclear power development from both the international and domestic aspects; and (2) what progress has been made in meeting the need that exists.

Chairman ANDERSON. Do you intend to deal with this question of the international race as you go along?

Mr. SIGAL. That is the next item.

Chairman ANDERSON. I am primarily interested because of the announcement that was in the New York papers on Sunday—and other papers, too—that the Soviet Government was planning a pretty extensive development along this line. I tried to bring out yesterday that Britain had a pretty elaborate program that was moving along quite rapidly.

I raised the question, then, as I do now, do we stand back and watch these two, or do we depend solely upon what private industry has thus far indicated it will do, or do we apply a real test and ask when is private industry going to start. Then, if the start is late, what do we do about it?

Mr. SIGAL. That is my approach.

Chairman ANDERSON. The point I had in mind is that we took these bids or so-called applications on April 1st of last year, and here we are in the month of March of this year and we find no action has been taken. From my point of view very little action has developed in the intervening year. Do we wait another year to see if anything

happens? If so, how many more years do we wait before we get underway? Do you propose to discuss that?

Mr. SIGAL. Yes; I propose to elaborate on the very points you mentioned.

First, on the need for immediate nuclear power, the international aspects.

The importance of the rapid development of peaceful uses of atomic energy, insofar as it relates to the world situation, is well summarized by Gordon Dean, former chairman of the Atomic Energy Commission, in his book Report on the Atom:

> The importance of atomic energy to the future economic health of the free world must not be underrated. If the present uneasy truce between the East and the West continues indefinitely, it will probably be because the Soviet Union is betting that the industrial economy of the Western nations will ultimately collapse through overproduction, unemployment, and depression. It is axiomatic that we cannot afford to let this happen. Atomic energy can help to keep it from happening. * * *
>
> Atomic energy can help the economy of the free world in at least three ways: It can provide a new, inexpensive source of power than can help reduce industrial production costs in many parts of Europe and elsewhere; it can create new markets for the industrial production of Europe and America by helping to open up and develop the backward areas of the world; and, while it is building, it can create new demands for technical equipment and materials that can inject a fresh life into the industrial economy of the West. There is, therefore, a national and international security reason why we should pursue as vigorously as we can the development of the peaceful applications of atomic energy (p. 317).

Since those words were written the situation has become more urgent, because the world has learned considerably more about the extent to which the Soviet Union has developed power reactors, and the extent to which it is prepared to assist other countries in similar developments. Soviet participation in the Geneva Conference on the Peaceful Uses of Atomic Energy was characterized by the high level of the Soviet scientific and technological papers. In January 1955, the U. S. S. R. announced that it was prepared to offer assistance to its satellites and to China in development of their atomic-energy programs. Offers of assistance have also been made to a number of non-Soviet-bloc countries, including Yugoslavia, India, and Egypt. There can be no doubt that the U. S. S. R. has demonstrated a degree of competence in the field of atomic energy which, together with its large industrial capacity, would enable it to undertake major developments in the peaceful applications of nuclear energy.

As you point out, Senator, this latest announcement, which I did not have an opportunity to incorporate here, proves the intention of the interest of the Soviet Union along these lines.

We are all keenly aware that within the past year the Soviet Union has greatly stepped up its program of economic assistance to non-Soviet-bloc countries, particularly in the Middle East and Latin America.

On June 25, 1953, Mr. Putzell, representing the Monsanta Chemical Co., speaking to this committee with reference to the urgency of developing nuclear power, declared:

> Let me emphasize: As soon as possible. For if the United States does not focus all of its resources, both Government and industrial, on the prompt development of economic atomic power, any of several other nations may do so, and succeed with the attendant political, social, and economic implications. That is so because the large body of basic scientific knowledge application to nuclear reactors, in contrast with that concerning military applications of atomic energy,

is unclassified and available to skilled nuclear scientists around the world (Atomic Power and Private Enterprise, p. 174).

It would be incredibly shortsighted of the United States if it did not not use its tremendous technological knowledge in the atomic-energy field in this worldwide struggle for men's minds and loyalties. The Geneva Conference, particularly, should have made us fully aware of the fact that many countries of the world are literally starved for power and there is probably nothing aside from peace, as Gordon Dean has stated, that these countries want more than a vast increase in their electric-power resources.

The recent generous offer of President Eisenhower to make available a large stock of nuclear fuel to friendly nations will turn out to be an empty, tantalizing gesture if these nations are not supplied with the wherewithal to make effective use of this fuel. It is not enough, in our opinion, merely to say that we are prepared to assist them in the construction and use of research reactors. Years will pass before they will be able to convert their knowledge into the production of electric power.

The United States does have more extensive knowledge on these matters, at least at the present time, than any other nation in the world. It has the resources. All it needs now is the will to develop its own knowledge to the extent that it can maintain itself as the unquestioned world leader in this field. Is it not utterly inconsistent on our part to spend billions on many types of assistance to foreign nations, but to refuse to spend the relatively small amount of money necessary to hasten arrival of the day when we can show power-hungry, underprivileged countries how to produce nuclear power that is economically feasible for them?

We submit that it is inexcusably shortsighted for us to allow the program for development of full-scale reactors to founder because of an unjustifiable ideological concern that our system of free enterprise will somehow be irretrievably damaged if our Government builds a few large-scale reactors.

In our view, the foregoing considerations alone require that the Atomic Energy Commission proceed immediately with a vigorous program for constructing full-scale nuclear reactors for the production of electric power.

On the domestic aspects: A further justification for the development of atomic energy, on an urgent basis, as a source for electric power is that the need for power for domestic use will, in the immediate future, develop at a galloping pace. In our judgment, this need is underestimated in the report of the McKinney panel. The panel appears to believe that the present abundance of conventional sources of power in this country assures us of an adequacy of power supply so far into the future as to give us no concern about finding new sources or energy.

This assurance is not warranted by the evidence. The concensus of industry experts asked by the panel to estimate the probable future market for nuclear power in this country was that electric generating capacity will increase fivefold in the next 25 years. Specifically, the increase will be from 115 million kilowatts installed capacity today, to 600 million kilowatts installed capacity in 1980. Stated in other terms, in the next 25 years we shall have to develop

5 times as much new power as we developed in the past 50 years. This means that for electric power alone we shall be making new demands upon our energy resources at 10 times the rate we drew upon them in the past half century.

The panel's report understates this factor of increased power requirements in appraising the future role of atomic energy in our economy. To the report of the experts whose opinions it had solicited, the panel added a second forecast of questionable reliability which predicts only 360 million kilowatts for 1980. The panel then expressed the opinion that actual requirements probably will fall somewhere between the two. The experts did not approve this dilution of their opinions. When confronted with the lower estimate, the experts reasserted their opinion in support of the higher figure. I have attached to my statement a more extended analysis of the materials submitted to the McKinney panel showing, in effect, that the panel's report does not adequately represent the views of its experts.

This difference in the estimates of our power needs over the next 25 years is a matter of vital importance. If the conservative estimates supported by the panel are correct, it is obvious that there would be less urgency for an all-out nuclear power program. On the other hand, if the estimates of the panel's experts are correct, it is probable that, if we do not engage in an all-out program of development of nuclear power, we will not be able to meet the demand of 600 million kilowatts in 1980. In our opinion, we simply cannot afford to take such huge risks.

Adequacy of the power supply over the next 25 years is not, however, the only consideration that gives urgency to the need for developing nuclear power. Another consideration is reduced power costs. Nuclear power can become a cheap source of power for large areas of the United States within a relatively few years. The experts' report to which I have already referred shows this possibility. Mr. Reuther's separate opinion analyzes the data supplied by these experts to show that atomic energy could become a source of really low-cost power throughout the United States if favorable technological possibilities are realized.

Wide areas of the United States have been denied the benefits which low-cost power has brought to such sections as the Tennessee Valley and the Pacific Northwest. High cost power is one of the factors responsible for the economic distress in New England. In view of the possibility that nuclear power can bring cheap or certainly competitive power to New England within the foreseeable future, public policy should give high priority both to exploring and exploiting that possibility.

Now we turn to progress in developing nuclear power.

The panel has expressed the view, in substance, that private industry has satisfactorily assumed the risks and burdens of developing electric power from atomic energy, and that the projects now being planned or talked about—

constitute an orderly and sound exploration of atomic energy as a power resource for large integrated electric utility systems for mature industrial economies.

On the other hand, the Commission takes a much more conservative approach to the problem of exploration and exploitation of this new power reserve than does even the panel.

In its comments on the panel report, the Commission stated:

1. That until the use of atomic power as a source of electricity is reasonably competitive in cost with the use of conventional sources, we cannot expect extensive use of private capital to exploit it for commercial purposes, and that competitive costs for use of such power are not an immediate prospect;

2. That Government funds can be most profitably employed in research and development, and that the test of whether or not Government funds should be used for full-scale power installations should be whether the project is truly applied research, whether it will contribute to the art, and whether or not private funds are available for the purpose.

Although the panel did not decide for itself whether private industry is assuming the risks and burdens involved in achieving competitive power, the Commission says that present indications are that it will do so. We "expect," says the Commission, that industry will assume this responsibility. If industry does not do this, says the Commission, some additional public funding may be necessary; it would be premature to decide at this time that public funds should be used to build a full-scale plant of each of the reactor types. When Commissioner Vance was pressed as to the meaning of the word "premature" and how much time it would take the Commission to decide how much public funds would be necessary he expressed the opinion that we should wait 2 years to determine these facts.

The Commission majority has told your committee that 12 private demonstration reactor programs are underway, and has stated that $255 million of private capital has been committed to the power reactor program.

The record shows that at the present time only one full-scale nuclear reactor is in construction for power purposes, namely, the pressurized water reactor at Shippingport, Pa. This certainly cannot be considered a reactor being built with private capital. Admiral Rickover described the original and development of this project graphically in a press conference on December 6, 1955. The story can best be told in Admiral Rickover's own language:

> With all this going on, the Commission realized that if there was to be any atomic power, the Government was going to have to pay for it. Consequently, our Chairman, Admiral Strauss, went to the President and got permission for the Atomic Energy Commission to undertake such a development. Congress finally appropriated $100 million, and said the cost was not to exceed that amount.
>
> The actual cost—this is the PWR I am talking about, the first pressurized water reactor—is estimated to be about $85 million, of which $47 million will be research and development, and $38 million will be for construction costs * * *.

After pointing out that Duquesne Light Co. and Westinghouse Electric Corp. are participating in this project, Admiral Rickover continued:

> We started constructing this plant in May of this year (1955). We expect to have it done in 1957. So you see that we are designing, developing, manufacturing and building an atomic powerplant in generally less time than it takes to build a conventional powerplant.

It is to be noted that of the $107 million anticipated cost of this reactor, only $15.5 million, or slightly over 14 percent of the total cost, comes from private sources.

This is an excellent example of the speed the Government can command in cases of this nature. It provides an eloquent and devastating reply to those who, like Commissioner Libby, tell this committee that there is a shortage of technical experts and that private industry has the required personnel. This experience fully supports Commissioner Murray's contention that if the Government wants to engage in a program of constructing full-scale power reactors immediately, it can get the job done.

On the other hand, although almost 2 years have passed since adoption of the 1954 amendments to the Atomic Energy Act, construction has not begun on a single full-scale power reactor under private auspices. We have no assurance that any of the projected private projects will, in fact, be built. None of these is finally committed. None of them has a permit to proceed with construction. None of them will get a license until it is approved for safety by AEC. One facility for fabricating fuel elements is being built but cannot yet quote firm prices or given performance guarantees.

Moreover, as this committee is well aware, none of these projects will proceed without solution of the insurance problem. Adequate private insurance is not now available and there is no prospect that it will be available in the foreseeable future. If, as seems likely, the Commission will recommend to this committee that the Government assume the so-called residual risk, which may well be the major part of the entire risk involved, the argument that private capital should control the rate of development really becomes untenable.

Let me recall to you the testimony given to your committee on February 16, 1956, by Walker S. Cisler, president of Power Reactor Development Co. Mr. Cisler, I am sure you remember, was one of those who is 1953 and 1954 urged amendment of the Atomic Energy Act because private industry was so eager, willing, and ready to invest its funds in nuclear power reactors. Mr. Chisler now declares that there are a number of conditions which must still be met before his group proceeds with consideration of its fast breeder reactor. In addition to the necessary licenses, he wants assurance from AEC of an adequate fuel supply; that AEC will charge a satisfactory fee for reprocessing of spent fuel; that AEC will establish a fixed and adequate price for fissile material; that, satisfactory arrangements can be made with AEC on research and development work; that the companies involved in the project will be exempt from the Holding Company Act; that the Internal Revenue Bureau will issue a ruling that capital contributions of the participants will be deductible for income tax purposes; and that there will be adequate insurance against public liability. Mr. Cisler also stated that his company is still negotiating with AEC on fuel rental. Until these conditions are met, says Mr. Cisler, the pledges of capital contributions by participants are not binding. In short, this project has not yet been financed. When, if ever, all these conditions will be met is certainly not known now. Yet according to AEC releases, this project is scheduled for operation in 1959.

That is not the way Mr. Cisler talked to this committee when it seemed so urgent that private industry get into this field. For example, he stated to this committee on June 25, 1953:

> There are many well-known reasons for carrying the atomic energy development forward without undue delay. This can be done adequately and upon the broad front that is required only with the participation of competitive industry. It is important, therefore, that the law be modified in the near future.
>
> Our project and our plans to undertake private financing of a reactor may be used as an example to illustrate this point. If we assume that our studies will be completed in 1954 and that we conclude that a trial installation should be built, then we should be in a position to proceed with the next steps, detailed design and construction, without delay. In order to proceed with these, we would need to know that the financing is complete and that money is available for the entire construction program.
>
> Obviously, many problems must be met in undertaking such a venture, and a substantial amount of time, probably a year or more, will be needed to complete the negotiations. If we are to meet such a schedule, law modifications in the near future are essential (Atomic Power and Private Enterprise, p. 139).

At that time Mr. Cisler introduced a memorandum which contained the following statement:

> Traditional competitive free enterprise is ready and able to undertake the task. Private industry is prepared to promote this development both with trained personnel and also with large investment of private capital as soon as conditions are right. The time has come when consideration must be given to changes in the Atomic Energy Act to encourage substantial investment of private industrial resources (p. 151).

When these statements are compared with current performance it is obvious that the hot breath of passionate desire to build reactors has simmered down to a cool zephyr.

Another of the projects mentioned by the Commission is the Pennsylvania Light & Power proposal. This company will not even begin design until 1958 when it hopes to have the results of the experimental homogeneous reactor now being built by AEC.

The Yankee Atomic Electric project was not approved by AEC for negotiation until a few weeks ago. Seven of the 12 projects which the Commission told you are underway are small reactor projects submitted to AEC on February 15. Obviously, these have not yet been reviewed, let alone approved. Of these seven, it should be noted all are to be publicly or cooperatively financed.

Chairman ANDERSON. They are all either REA cooperatives or public groups?

Mr. SIGAL. That is right.

For the Commission majority to say $255 million of private capital and $50 million of public capital has already been committed to 12 projects is grossly to misrepresent the actual progress as of this date. When the Commission appeared before you last week, it did not, because it could not, disprove the truth of Commissioner Murray's statement of February 23 that—

> We have no firm assurance that the widely advertised 800,000 kilowatts which are promised for 1959 and thereafter will actually go into existence.

At an AEC press conference last December 6, W. K. Davis, Director of the Division of Reactor Developments, said virtually the same thing:

> It is certainly too early to predict at the moment how many of these, other than PWR (pressurized water reactor) will in fact be built.

But let us suppose there is a firm commitment of $255 million. Can that be considered adequate in a matter of such great importance to our Nation's future? Simply by way of comparison, I call your attention to the fact that Mr. Gale, of Commonwealth Edison, testified that his utility company is spending $150 million a year on new conventional power facilities. Yet this company and its seven associates are putting in money at the rate of $9 million a year on their reactor project.

Commissioner Strauss stated to your committee last week that he had just been informed that private industry will spend $20 to $25 million this year on nuclear power projects. It is a little short of incredible that the Chairman of a Government agency charged with such vast responsibility should at this late date express gratification for a $25 million annual outlay on atomic power.

Despite the small amounts involved, it is highly questionable that all of these proposed contributions are private risk capital. This committee may well inquire into the question of how much of this money is really public money. If a major part of it turns out to be public money, that would constitute another strong reason why private industry should not control what or how much shall be done, and how soon it should be done, in this field.

Here are some of the pertinent questions. How much of the private investments will be subject to fast writeoffs for income tax purposes? The $5 million contribution of Duquesne Light & Power Co. toward the Shippingport reactor has been certified by ODM for writeoff of $4 million in 5 years against Federal income taxes. It has also been certified to write off $6,375,000 of the $9 million it proposes to invest in the nonnuclear portion of the plant. Thus 75 percent of the total private investment will be written off in 5 years. These fast writeoffs are, in effect, interest-free loans from the Government.

Another question is, to what extent will utility investments in nuclear reactors be charged to current operating expenses? Of the $45 million which Nuclear Power Group, Inc. proposes to invest in its reactor, $15 million is to be charged to operating expenses for research and development. In that form it will not be subject to income taxes. Of equal or greater importance is that this device will enable the utility to use these expenditures to justify the continuance of their present rates for electric power, or to support a demand for an increase in these rates.

At this point I would like to refer you to the last page of this document, which quotes from the same December AEC press interview. Mr. Davis is discussing the matter in answer to some questions, and Mr. Davis says, on the lower half of that page:

> It is a question whether you are going to do these things at research and development cost. If we didn't believe you could make nuclear power competitive with conventional power, we would be very silly to be building plants which are more expensive than conventional plants if we thought this was always going to be the situation. On the other hand, where we do believe we can make them competitive, but in order to do so we have to build the first and maybe the second generation to do this, you have to charge this extra cost of the first or second generation essentially to research and development in order to get there. There is no way to go from the basic technology to full-scale economic plants in one jump.
>
> Question. In other words, the private companies will charge it off to research and development?

Mr. DAVIS. Yes, which essentially means they will charge it off to the people who pay for the electricity. The Government does, by charging it off to the taxpayers. It is mainly a question of which group of people is going to pay for it.

Obviously it is not going to be the investors who are going to pay for it.

Chairman ANDERSON. We are anxious to get comments, I am sure, on the panel recommendations on some of these things. The Murray recommendations were not too far from some things that the panel suggested. They accepted the domestic figure of 800,000 kilowatts and said if private industry doesn't do it, the Government should do it. Then they said the United States in issuing invitations to such conferences announces it is prepared to furnish nuclear fuels and so forth—and I don't want to go through all of them—to at least permit the contract for installation of at least one million kilowatts of atomic generating capacity outside of the United States by 1960.

In that particular respect of the Murray recommendation of a million kilowatts at home and a million kilowatts abroad is not too far from what the panel seemed to have in mind. Do you think that is a reasonable figure?

Mr. SIGAL. In the first place, I think it should be pointed out that Commissioner Murray said we have no assurance that we will get the 800,000.

Chairman ANDERSON. I am going to stay away from that question entirely. Do you think a million abroad and a million at home by 1960 is a reasonable goal?

Mr. SIGAL. On that particular question we are prepared to accept Mr. Murray's statement. Actually in my opinion it should go considerably more than a million considering the need abroad. But on that point we are not making an issue of the amount that Mr. Murray suggested as the amount by 1960.

Chairman ANDERSON. His figure is very comparable to the panel figure.

Mr. SIGAL. Domestically.

Chairman ANDERSON. And abroad.

Mr. SIGAL. The panel? I am sorry. I thought you were referring to the Commission. So far as the panel is concerned, that is correct.

Chairman ANDERSON. I said we are very anxious to keep the panel and committee and Commission and other things pretty well separated.

Mr. SIGAL. You are correct on that. As I understood Mr. Murray, the question is can we get it done as the thing now is being handled.

Chairman ANDERSON. Mr. Murray and the panel had a very substantial difference on the domestic picture.

Mr. SIGAL. That is right.

Chairman ANDERSFN. The panel said let private industry do it if it will. If it doesn't, the Government should step in and do it. Of course, I am not quoting them accurately. Mr. Murray says, "We know private industry is not going to get it done, and the Government might as well start ahead with it."

Mr. SIGAL. That is right.

Chairman ANDERSON. Regardless of the procedure or the route that is followed, I am trying to find out if you think that a program of that size is necessary. Then later we can get down to the question of who does it.

Mr. SIGAL. We think it is conservative. We are not challenging the figure. We think it should go higher. We don't think it is too high by any means.

Chairman ANDERSON. I think it could not well go lower.

Mr. SIGAL. It could not go lower than that if it were to be useful for these purposes, particularly for the purposes for which we think international assistance should be given.

There can be little doubt, in the light of such arrangements, that the utility rate payers and the Federal Government will bear the burden and the risk of the major part of these investments. There is little justification, consequently, for calling these investments private risk capital.

Finally, even if we assume that all the private reactor projects will eventually go through to completion we must recognize that the companies in charge of these projects control their timing. The determination to push ahead with great urgency, or to move along at a desultory pace, is a wholly private decision, but it is a decision frought with great public consequences.

In our opinion, the evidence strongly supports the conclusion that American industry, or at least that portion of it which will build the power reactors, is in no hurry at all. Their objective, as we see it, is to demonstrate some token activity in order to support their claim that they have occupied the field, and the Federal Government should do no more than give them such assistance as they request. Mr. Reuther's separate opinion quotes at Geneva dispatch to the Wall Street Journal (August 22, 1955) which says somewhat cynically that this is the controlling incentive:

> Officials of the companies which make reactors say frankly that most of their utility company customers have no early expectation of cutting costs by building atom plants; their primary motive is to stake this out as an area of private rather than public power.

Fortune magazine, in its issue of August 1955, also attributed this motive to the utility industry's interest in nuclear power:

> Utility executives * * * are not motivated solely by an urge to bring cheap nuclear power to the world. One of their chief reasons for acting, perhaps the most important one, is referred to only guardedly. The utility industry is mortally afraid of public power. "You know what happens," says one of the industry's leaders, "If you leave a vacuum, something will fill it. We don't propose to leave an atomic power vacuum."

Neither the McKinney panel nor the Commission have stated the degree of urgency with which the development of electric power from nuclear reactors should be pursued. The panel's recommendations, as above indicated, draw a distinctions between exploring the technological resources of atomic power and exploiting atomic power as a source for electric power. This distinction is made quite clear in the panel's report by the following statement:

> Impact from atomic power can come from exploring this field technologically, as well as from its commercial application. Thus two different determinations, as yet not clearly embodied in Government policy, must be made as to the urgency of getting on with atomic power. The first relates to the need for or desirability of technological development of atomic energy as a power resource; the second, related to the first, involves the rate at which this resource should be commercially developed.

The panel appears to believe that the present program represents satisfactory progress in the exploration of nuclear power, and says that

we may defer until 1960 a decision as to the need for nuclear power in the United States. The Commission seems to join in this comfortable and relaxed view of the situation. I have sought to bring home to your committee, in the foregoing discussion, that the Commission's program is based on invalid assumptions, and a very narrow view of our national and international opportunities and obligations.

In conclusion, I want to say that we share Mr. Reuther's opinion that the need for exploration and for exploitation of nuclear power is urgent. We share also his doubt that the incentive to utility companies to get nuclear power on the line is strong enough to make them explore and exploit it with a sufficient sense of urgency. With both Commissioner Murray and Mr. Reuther we share the view that the existing risks and requirements of nuclear power development, both technical and financial, cannot today be met by private enterprise. In the present state of the art, direct Government participation in the building of demonstration reactors is as essential to the achievement of satisfactory results as it has been in the basic explorations, experiments, and developments which gave this country its preeminent position in the atomic field. Senator Gore's bill, S. 2725, will assure accomplishment of this objective, and it should be enacted into law immediately.

Now that we are putting the atom to work for peaceful purposes, it is imperative that we show the same capacity to join together the forces of Government and private enterprise in the achievement of national objectives as we have done in probing the atom's secrets and releasing its power for the purposes of war.

That is the end of my formal statement, Mr. Chairman. I wish you would note that I have two appendixes attached. One is an analysis of the experts' report on the need for electric power, showing that in our opinion the panel did not accurately consider the views of its experts.

The second is the one from which I quoted, the December 6, 1955, AEC press conference.

Chairman ANDERSON. These two appendixes will be attached to your statement. The lower of those reports was the estimate of the Federal Power Commission which is the Federal agency to which the panel would naturally place some attention.

Without objection, they may be inserted in the record at this point.

(The information referred to follows:)

APPENDIX A

OBSERVATIONS OF THE CONSERVATIVE FORECASTS OF FUTURE ELECTRICAL POWER REQUIREMENTS IN THE UNITED STATES ADOPTED BY THE PANEL ON THE IMPACT OF THE PEACEFUL USES OF ATOMIC ENERGY

On November 23, 1955, a report entitled "A forecast of the growth of nuclear fueled electric generating capability" was submitted to the panel. This was prepared by General Electric Co. based upon the combined judgment of individuals and groups who reviewed the forecast at three meetings. The first meeting on October 12, 1955, was made up of representatives of Babcock & Wilcox, New England Electric Systems, Westinghouse Manufacturing Co. and General Electric Co., together with Mr. Kenneth Davis of the AEC Reactor Division and Mr. Lane of the Oak Ridge National Laboratory.

The second meeting, October 31–November 1, 1955, was the power seminar to the panel which included representatives of electric utilities and electric manufacturing companies.

The third meeting on November 8, 1955, was attended by representatives of the Federal Power Commission, of the Department of the Interior, and three representatives of General Electric Co.

The report says, "An essential factor in the analysis is the projected growth of electric generating capacity of all kinds to supply the anticipated load demands of the country. * * *

"From the several available forecasts of total generating capability, two have been selected for presentation and the results from each have been computed as series I and series II in part V of the report.

"Series I is based on the September 19, 1955 forecast of the Electrical World 1955–1970 extended at 6½ percent increase annually to 1980. At 1980 this forecasts 600 million kilowatts of installed capability. This forecast was adopted by the October 12 conferees as their best judgment. In the power seminar of October 31, this judgment was confirmed by essentially all of the industry representatives expressing an opinion. Therefore, the series I estimates should be considered as representing the combined judgment of these two groups on this important point.

"Series II is based in the Federal Power Commission 'Estimate of future power requirements of the United States' 1954–1980 released in October 1955. With additions for reserves this projects 358 million kilowatts of capacity required by 1980. The difference is substantial.

"The presentation in this report of nuclear power forecasts based on both the Electrical World and FPC estimates of total power requirements, therefore, gives a wide bracket to be considered by the reader. As indicated earlier, the consensus of both the conferees of October 12 and the power seminar was that series I represented the best judgment of these particular people."

In section V of the report the following is stated:

"A number of forecasts have been made by qualified groups. The divergence of some is substantial. Referring to the following table II. It was the opinion of the conferees and the power seminar that the series I forecast represented their thinking concerning future industry capability. However, at the request of the panel and for comparison purposes, curves and tables also include calculations based upon series II."

In the concluding section VI of the report entitled "General observations" the following is stated:

"The general concurrence of the conferees with the assumptions, the method of analysis and, in particular, the closeness of their independent forecasts of results shown by series I certainly strengthens confidence in this forecast. As previously pointed out, at the request of the staff of the panel, series II has been included for comparison purposes, which shows widely different results. The primary reason for the wide spread is the different forecast rates of growth at the time when it appears nuclear power will be entering the picture."

The difference between the series I forecast, namely, that we shall need installed generating capacity of 600 million kilowatts in 1980, and the series II forecast that we shall need 360 million kilowatts in that year, is substantial. Obviously, it bears significantly upon the degree of urgency with which any new source of energy, including nuclear power, should be developed.

If the series I forecast is correct, the present installed capacity of 115 million kilowatts will have to be increased fivefold in 25 years; whereas if the series II forecast is correct, the present capacity will have to be increased only threefold.

The series I forecast puts us on notice that in 25 years we may have to develop five times as much new generating capacity as we have developed in the United States during the last 50 years—in short, we shall have to develop new power facilities at 10 times the rate at which we developed them over the last half century.

Which of these two forecasts is the more reliable as a guide to present public policy is, therefore, a question of central importance in defining the urgency that should be given to the development of electric power from atomic energergency, and from all other sources.

This being the case, three factors of the panel's report to the Joint Committee are highly significant as indicating a purpose on the part of the panel, or of those who drafted its reports, to arrive at a conclusion that there is little urgency in the development of nuclear power for domestic purposes, or perhaps no urgency at all.

These three factors are:

1. Despite the concurrence of the panel's experienced advisers, as noted above, that the higher forecast should be relied upon, and despite the fact that the lower forecast was included in the report to the panel "at the request of the staff of the panel," but without the approval of the panel's experienced advisers, the panel's report to the Committee assigns equal validity to these two forecasts. On page 33, it says:

"We feel that the actual growth of electric-generating capability in the United States may fall within the range of existing forecasts. We do not assert that the lower limit will in fact be reached, nor that the upper limit will not be exceeded. We only say that a good measure of what seems reasonable lies within these limits. The guidelines provided by these forecasts outline the area within which nuclear power will have an opportunity to grow."

2. The panel did not take care to inform the Joint Committee that its expert advisers believed that only the higher forecast should be relied upon.

On page 38 of its report to the Joint Committee the panel states: "These values were derived from a basic study of nuclear growth rates prepared for the panel by a special study group." While not literally false, this is a misleading half-truth which the Joint Committee should not accept as representing the views of that special study group.

In the reprint of the experts' report in volume 2 of the panel's report, the underscored sentences in the passages quoted above were deleted, with no indication that the text of the report had been altered.

3. The lower forecast of electric power requirements, inserted in the experts' report "at the request of the staff of the panel," was made by the Federal Power Commission.

Federal Power Commission estimates of future power requirements in the United States have fallen short of actual power growth so frequently and for so many years as to have become somewhat notorious in that respect.

Mr. Reuther's separate opinion cities an example on page 9—power used in Southeastern United States in 1955 (excluding AEC consumption) was almost double the FPC forecast for that year and was already 32 percent higher than the power requirements forecast by FPC for that area in the year 1970. Again, New England power consumption in 1955 was at a rate which FPC predicted would not be reached until 1960.

APPENDIX B

EXCERPTS FROM UNITED STATES ATOMIC ENERGY COMMISSION PRESS SEMINAR ON CIVILIAN POWER REACTOR DEVELOPMENT, UNITED STATES DEPARTMENT OF COMMERCE AUDITORIUM, 7:30 P. M., TUESDAY, DECEMBER 6, 1955

* * * * * * *

Question. Where a commercial installation is working toward 15 mill power, how will it charge out that power?

Admiral RICKOVER. Charge the customer.

Question. How will they do that competitively to 3 or 4 or 5 mill power?

Admiral RICKOVER. You mean the 3 or 4 or 5 mill power for a present plant?

Question. Yes.

Admiral RICKOVER. They would put it into their system.

Question. How will they do it against their capital structure? How can you justify charging it out? Presumably you might be able to create that power for 3 or 4 or 5 mills, how can you economically say you will arbitrarily create 15 mill power? * * *

Admiral RICKOVER. That is what the utility commissions take care of. This is the same situation you had when the electric industry started. It was high cost and the utility commissions took care of it.

Mr. DAVIS. It is a question whether you are going to do these things at research and development cost. If we did believe you could make nuclear power competitive with conventional power, we would be very silly to be building plants which are more expensive than conventional plants if we thought this was always going to be the situation. On the other hand, where we do believe we can make them competitive, but in order to do so we have to build the first and maybe the second generation to do this, you have to charge this extra cost of the first or second generation essentially to research and development in order to get there. There is no way to go from the basic technology to full-scale economic plants in one jump.

Question. In other words, the private companies will charge it off to research and development.

Mr. DAVIS. Yes, which essentially means they will charge it off to the people who pay for the electricity. The Government does, by charging it off to taxpayers. It is mainly a question of which group of people is going to pay for it.

* * * * * * *

Representative COLE. I have no questions of Mr. Sigal. I should like to make an observation to correct an erroneous impression in statements which he made with respect to the funds that are now being spent by private concerns in the atomic energy field amounting to 25 or 30 million dollars, which in my opinion is a substantial amount of money for any corporation to spend in surveys and studies and inquiries. Particularly, Mr. Sigal indicated that this amount of money, no matter what the dollar quantity was, did not come out of the private stockholders, but in some fashion or other it came from the Public Treasury, which is about as incorrect as any conclusion could be.

Mr. SIGAL. May I interrupt?

Representative COLE. I am not asking any questions. I am simply stating my opinion, and then you can say anything you may want to.

Of course, the treatment which might be accorded to expenditures by utility companies in the matter of atomic research is determined by the individual States through their public utility bodies.

I raised this question with Mr. Cisler when he was before the committee 2 weeks ago, and he responded at that time, and in addition submitted to me a letter, which indicates that with respect to the State of Michigan, the funds which are used by his company—I think it is this year—amount to 2 or 3 million dollars by his company alone, and are considered as operating expenses, and therefore are charged against operating income, so therefore to that extent lessen the profits which the company otherwise might have. From that standpoint they actually do come out of the stockholders' pockets.

Furthermore, those expenditures are not allowed by the Michigan Utilities Authority to be in any way reflected in their rate structure.

So at least as far as the State of Michigan is concerned, expenditures made by utilities in those fields do come from the stockholders, and not from the Public Treasury, or rate differentials.

I have a letter from Walker Cisler on this subject which I ask be inserted in the record.

Chairman ANDERSON. Without objection, that may be done.

(The letter referred to follows:)

THE DETROIT EDISON CO.,
Detroit, Mich., February 23, 1956.

Hon. W. STERLING COLE,
House of Representatives,
Washington, D. C.

DEAR CONGRESSMAN COLE: I regret that time did not permit me to give you a more complete answer to the accounting question you directed to me on February 6, 1956, and because I felt you would wish to have a further explanation, I hasten to supplement my statement to you.

May I direct your attention to a copy of an order of the Michigan Public Service Commission which you will find annexed to my statement filed with the committee. That order provides that the aggregate of our contributions or payments in aid of research and development of an experimental fast neutron breeder reactor shall be recorded in account 801 of the uniform system of accounts, research and development. This is an operating account. This order is based upon the findings of fact made in that order. The testimony before the Michigan Public Service Commission, both by the company witnesses and the Commission witness was voluminous. All types of reactors were reviewed. The testimony established that there was less known about the fast neutron breeder reactor than many of the other types, and when comparison is made, the experimental nature of the fast neutron breeder reactor becomes most apparent.

It follows that when a charge is made to an operating account, it does not thereafter appear as an asset devoted to public service. In this State, a utility is entitled to a reasonable return upon the fair value of property devoted to the

public service. Therefore, I assure you that our rate of return would not be computed upon any part of the reactor plant, even if you assume that the Detroit Edison Co. was the owner of the reactor. Under our plans the power reactor company would be the owner and operator of the reactor which would generate steam to be sold to the Detroit Edison Co. The power reactor development company therefore would not be a utility under the laws of this State because it would not sell to the public, hence the question would only arise in the future if the Detroit Edison Co. was to own and operate the reactor. Under existing facts and circumstances, I do not perceive the possibility of the rates of the Detroit Edison Co. being affected one way or another by reason of its participation in the power reactor demonstration program.

The findings of fact contained in that order are not only exhaustive, but reflect its concept of the research and development account. I believe you will wish to examine it.

With kindest personal good wishes, I am,

Sincerely,

WALKER CISLER.

Mr. SIGAL. Perhaps Mr. Cole misunderstood my statement. I did not say these moneys came from the Public Treasury. I said they came out of the public.

This would occur in two ways the maintenance or increase of rates which the rate payer would have to pay, and the other of course in part as income-tax deductions.

I did not want to leave the impression that the fact that these may be charged to operating expenses is in any way illegal. That was not the point. I was aware of the ruling of the Michigan Public Utility Commission. We are only pointing out that in our view this is not private money. It is not risk capital. What they spend, they will get back from their rate payers or from adjustment on their income tax. In one fashion or another there is no risk involved. As to whether or not this will go into the rate base, it is certainly quite probable that once this money can be charged against research and development and operating expenses, it will be charged to rates. That was the opinion of Mr. Davis, speaking for the Atomic Energy Commission in this press conference which I just quoted.

Chairman ANDERSON. Thank you.

Mr. Swisher, will you come forward.

STATEMENT OF ELWOOD SWISHER, VICE PRESIDENT, OIL, CHEMICAL, AND ATOMIC WORKERS INTERNATIONAL UNION, AFL–CIO

Mr. SWISHER. Mr. Chairman, my name is Elwood D. Swisher. I live in Denver, Colo., and I am vice president of the Oil, Chemical, and Atomic Workers International Union, AFL–CIO, with headquarters in Denver.

On behalf of my organization, I want to express support for the McKinney report on the impact of the peaceful uses of atomic energy. The Joint Committee on Atomic Energy is especially to be commended for creating this nongovernmental panel and giving it the authority as well as the responsibility to undertake such an important task.

I cannot help but say that one reason OCAW finds itself in agreement with the recommendations and conclusions of the McKinney report is that it parallels so closely the 10-point program for peaceful use of atomic energy presented to the Joint Committee by our organization on January 9 of this year.

Over and above our general support, I want to lay stress on two aspects of the McKinney report—the section dealing with safety and

health and the recommendation in the section on government organization that—

> the Commission provides a real focal point within its organization at which are concentrated authority and responsibility for defining the integrated objectives for research and development of the peaceful uses of atomic energy, both at home and abroad, for establishing definite requirements with time scales for accomplishments of these objectives, and for assuring expeditious execution of the necessary programs and projects * * *

To this latter recommendation we say a fervent, "Amen." We also feel that to implement this recommendation fully, an earlier recommendation of the McKinney report, to which OCAW addressed itself in its 10-point plan, must also be instituted—namely the elimination of useless and needless security restrictions.

HEALTH AND SAFETY

We wish particularly to compliment the wisdom and sagacity of the McKinney panel in their recommendations on the subject of safety and health in the peaceful uses of atomic energy.

However, based on the experience of our nearly 7,000 members employed in privately operated AEC installations—I might point out our Government-owned privately operated AEC installations—and out of our deep concern for the thousands of workers who will be affected by the constantly increasing indirect uses of nuclear energy in a wide variety of industries, we have a further recommendation to make to the Joint Committee.

We urge the enactment of a uniform Federal safety code covering the industrial uses of nuclear energy and the establishment of minimum compensation standards for radiation-induced injury and disease.

Enforcement of the code, we sincerely believe, can be left in the hands of State safety inspectors, but because of the peculiar nature of the problems involved in the utilization of nuclear energy and the fact that even today not all authorities are agreed on what constitutes an adequate safety standard in radiation exposure, we do not believe most State legislaturees have at hand enough information to guide them in establishing such a code.

As the labor seminar of the McKinney panel reported, a seminar on which I had the privilege of serving:

> There is a danger that the apparent good safety record at atomic energy installations may lull many into an unwise sense of security. The need for strict observance of necessary health and safety standards is actually increasing, both because radioactive equipment and substances are being used more widely and because such use is increasing by persons who may not be aware of, or as competent to handle, the dangers of radiation as atomic specialists.

One further point on the need for Federal compensation standards is that most State workmen's compensation statutes contain either time limits for filing a claim, or time limits on compensation payments, or both. Since radiation damage may not and often does not become apparent speedily, there must be no "statute of limitations" invalidating a worker's claim for compensation.

Further, the damage caused by radiation may well extend beyond the present concepts of the effects of industrial injury. Radiation damage may indeed substantially shorten life, or, equally seriously, effect genetic damage to the worker involved. In such circumstances

there should be no arbitrary time or dollar limits on availability of medical aid. The broadest concept possible should also be applied in determining an equitable basis for monetary compensation.

Existing State legislation was not written with these specialized problems in mind. Only two States at present, New York and California, have any specialized statute covering safety and health problems in the atomic energy field. Because the problem will extend into every State—not only those that have atomic energy plants, but those having industries using nuclear energy for process heat, laboratory testing, and production controls—there is need for Federal legislation in the field. Most particularly is this true because the present AEC safety standards do not necessarily apply in industries where reactors are not employed, and where the firm is not engaged in work on an AEC contract, but where radiation from the various isotopes is a constant danger nonetheless.

Frankly, we are not at all sure that the AEC standards on radiation exposure provide sufficient protection. We tend to agree with Professor Whipple who strongly recommended, in a special report presented at the Nuclear Engineering and Science Congress in Cleveland in December 1955—

a figure no greater than one-tenth of the 0.3 roentgen per week of the AEC be permitted in nuclear powerplants.

I might further point out that I think as a further protection for the workers in the AEC plants that it would be well within the realm and should be done by considering—or by a recommendation of this committee to the AEC—that a 6-hour day be proopsed for atomic energy workers as a further protection from the accumulative radiation that they are exposed to.

Chairman ANDERSON. Mr. Swisher, has your group made any calculations what would follow in the way of employment in these places where you have several thousand people involved if you tried to drop down to this lower standard suggested by Professor Whipple?

Mr. SWISHER. No; not on a full-scale detailed basis. What Professor Whipple recommends, I do not think, would affect an additional amount of workers. It would be a minor degree of new workers if you dropped down on the radiation phase.

Chairman ANDERSON. I wondered if it would not set a standard that would be so difficult to live up to that it would make it almost impossible to have human hands doing this, and we would have to find machinery to do it. I think it is a point that you might consider because some areas are living communities where the exposure is not too far from the figure that Professor Whipple has presented. You certainly would not recommend that they move out of those communities.

Mr. SWISHER. That is true, too. Of course, here is a problem that I do not have the answer to. It may be somewhere in the textbooks or in publications. The only place that we know of radiation is from the tests. Whether there is radiation being disseminated in the areas where people are living close to these plants I cannot answer.

Chairman ANDERSON. The radiation level in my home community of Albuquerque is several times above the radiation level of Phoenix because we are close to Los Alamos and some things that are going on

at Albuquerque. I do not propose to move to Phoenix. I know you do not propose that either.

Mr. SWISHER. No.

Chairman ANDERSON. It is only because I know you well enough to know that you are interested in this problem. I suggest that what Professor Whipple has proposed may be proper, but I do believe it would be worthwhile if you would try to investigate what that might do to the drive to have more and more of these tasks done by machinery which are now being very satisfactorily handled by workers in these plants.

You do not want this thing to get so high that it is unworkable. I know you do not, and I am merely calling it to your attention.

Mr. SWISHER. I appreciate one thing that is absolutely news to me, and that is the fact that being closer to the installations in New Mexico does increase the radiation in the neighborhood.

Chairman ANDERSON. It may not be the answer. We may have such fine sunlight that it adds to our situation. However, the people in Phoenix would not agree on that, I am sorry to say.

Mr. SWISHER. Especially with the recent bombardment from the sun we just received.

On the secrecy and security, of the many points in the McKinney report in which we find ourselves in fundamental agreement, there is one other in which we believe the panel did not go far enough. That is the general question of security, discussed in the section on "Control of information."

While we heartily concur in all three recommendations, there is yet another point that we wish to emphasize as it applies to atomic energy workers.

In the OCAW 10-point program we recommend:

> The procedures of security investigations and hearings involving the workers in the field of atomic energy must be revised to provide opportunity for an accused individual to clear himself.

And again:

> Most particularly there should be specific definitions developed as to what actually constitutes a security risk. No action of an employee which would constitute normal, just cause for dismissal should be masked behind a false classification of security. And certainly excluded from such definition should be participation in a legitimate, free democratic trade union.

We feel that these points have been overlooked by the McKinney panel and that they are important in the question of the impact of the peaceful uses of atomic energy. There is a vast machinery at work guarding the secrecy of atomic processes—much of which can hardly be considered secret since it has often been published abroad—and which is being used not only to invade the privacy of American citizens, but also to cast a cloud of suspicion over them for the rest of their working lives. If a man has a record of persistent drunkenness, certainly he is not the kind of worker any employer wants to have on the job.

However, a discharge for drunkenness is a thing a man can live down by mending his ways. A discharge for vague and mystic "security reasons" will probably prevent him from finding suitable employment for the rest of his days.

The security program, too, is being used to hamper the normal relationship of workers to their freely chosen collective bargaining

representatives. One very clear instance of this developed out of my trip last summer to the Geneva United Nations Conference on Peaceful Uses of Atomic Energy. While there, I saw literally hundreds of displays and models, and obtained a large number of papers dealing with United States AEC plants. Yet, I could not discuss this knowledge with members of our union working on these very processes. For what was freely available in Geneva, was at that time the subject of security regulations in this country, and workers who discussed certain phases of their jobs were subject to discharge.

As your distinguished chairman Senator Anderson has suggested, surely when something has been published in at least half a dozen foreign newspapers it can be declassified by the Atomic Energy Commission.

I might add that is still the case at this moment.

Chairman ANDERSON. I wish, Mr. Swisher, that you would provide us with some details of that. It is a little hard for me to understand. I do not mean now, and certainly not in open session.

Mr. SWISHER. I could spend a moment and give you an example.

Chairman ANDERSON. Very well.

Mr. SWISHER. I had taken some pictures of the model reactors and displays in Geneva and I had occasion just 2 weeks ago to be showing those slides at my house; and 1 of our members from 1 of our atomic energy installations was there, along with 2 other boys from the union, but not AEC employees. He could not enter into the discussions because it was still classified. He was still fearful that he might have to take another lie-detector test someday and he would not want to say that he had not entered into discussions on this.

Chairman ANDERSON. I think that is a thing that the AEC itself would be happy to clear up. I cannot imagine that they would want that situation to exist. Therefore, I only suggest to you that if you sometime later supply that to the AEC security officer—we can make the opportunity available to you or a member of your staff—because I am sure it does not make sense to have it that way, and I do not think the AEC would like to have it that way.

Mr. SWISHER. I am glad to have your statement on that because it is somewhat embarrassing to be talking to a group and find they cannot answer back.

Representative COLE. It would not necessarily follow that the man hesitated and declined to discuss it due to the restrictions that were then enforced by the Commission. It could be that out of a sense of habit and ultra degree of caution he felt that he should not. I would be very much surprised to hear you tell me that this particular man had consulted with the security people and was told by them that at that time he should not discuss the matter.

Mr. SWISHER. I do not know that he consulted with the security people because he did not know, in visiting my house, that he was going to see these pitcures. I can give another example.

Representative COLE. Do you not concede that it could have been out of a sense of caution and conscientious devotion to duty that he just declined to enter into the discussion?

Mr. SWISHER. You are possibly right there. Yet, they are governed and they feel they are governed, I presume, by day-to-day bulletins and changes in bulletins.

Representative COLE. Of course, they are governed by that.

Mr. SWISHER. That is right. In another case, one of our members helped to prepare one of the papers that we presented in Geneva. While I have not seen him in a couple of months, the last time I saw him that paper was still considered classified as far as installation was concerned, as far as their discussing it with outsiders was concerned. He himself told me that.

Representative COLE. That is rather meaningless unless you know the particular kind of paper that he worked on. It is conceivable that it should be classified.

Mr. SWISHER. It concerned operations of reactors.

Representative COLE. I agree with the chairman that I am sure the Commission has a desire for the employees or persons engaged in the program or related to it to enter into discussions as freely and openly as is humanly possible within the bounds of national security considerations.

Chairman ANDERSON. My only point, Mr. Swisher, is, when you mentioned lie-detector tests I knew where the man was working. I know the only place that it is being used at. Therefore, it seems to me that the man's reluctance could easily have been that here was a reactor that he understood theoretically. The declassification of the picture of that reactor might not have described the very sensitive process the reactor was using or the type of fuel the reactor was using that he knew was not available to the public.

Secondly, it might be that the worker was not sufficiently familiar with the security regulations themselves so that he wanted to take no chance. I would more or less commend him for not taking a chance because we all see the signs of these factories that what you do not tell does not betray the secrets of the country. I would praise the man, in a way, although I do go back to my suggestion that I think it would be helpful to us all if you would discuss that—because you have so many contacts with workers—with the AEC before you go back to Denver. You may have something that would be of great interest to them and I am sure of interest to us.

Mr. SWISHER. Let me point out that this group have not been subject to lie-detector tests now for 2 or 3 years. However, the fear is that it may come back any day.

LABOR-MANAGEMENT REGULATIONS

Perhaps it is not within the purview of the McKinney panel to make recommendations on the subject of labor-management relations in the field of peaceful uses of atomic energy. The fact remains that no such recommendations were made. I feel that I would be remiss in my duty did I not bring to the attention of this committee certain problems and recommendations for alleviating them, for they are part and parcel of the impact of the peaceful uses of atomic energy.

Without going into a detailed history of the establishment of the Atomic Energy Labor-Management Relations Panel, I can say that it is the feeling of our members in this industry that the panel has served its purpose and should be discontinued. We have had recourse to the panel on many occasions, and more and more lately have found that it tends to bypass the problems that are causing tensions between labor and management; and that it apparently, as a matter of policy,

will not make a ruling on an issue that sets a precedent in collective-bargaining agreements.

While this attitude may be commendable in that it reduces Government interference in collective bargaining, it is also unfortunate because it leaves the private contractors with the feeling that they do not need to give consideration to union demands, much less accede to a reasoned proposition put forth in negotiations.

This can produce only two results: One is the feeling on the part of plant workers that in order to win certain gains a strike is necessary; the other is a complete contempt for Government mediation services on the part of both workers and management. Neither of these attitudes is conducive to successful collective bargaining.

One of the most recent examples of this occurred in the case of our local 2–652 in Idaho Falls, Idaho. The issue at stake was the matter of isolation pay since our members are forced, through no choice of their own, to travel upward of 100 miles a day to get to their jobs. When the contractor, Phillips Petroleum Co., refused to discuss the demand, our members struck. They subsequently went back to work and agreed to submit their dispute to the AEC panel. This they did, even though they had previously gotten no consideration from a special factfinding body when the dispute arose 2 years earlier. They presented a detailed case for isolation pay and were convinced they had won the day when the attorney for Phillips presented literally no case and hardly any rebuttal of the union's argument.

Yet, when the panel issued its decision, it refused to rule on the question at all.

Representative COLE. What is the status of that situation about isolation pay out there?

Mr. SWISHER. I am afraid this sentence is misleading. I was going back to it, Congressman Cole—"They refused to rule on the question at all." It denies isolation pay.

Representative COLE. Who did?

Mr. SWISHER. The panel did.

Chairman ANDERSON. This is the AEC panel. Let us be careful before we get into this McKinney panel.

Mr. SWISHER. This is not the McKinney panel. This is the labor-management panel. As of now—the contract had been accepted last week—the members have resigned themselves to the denial of their demand for this. The contractor went ahead and renegotiated the wages and some other parts of the contract and it is now closed. The issue is not dead even though there will be an existing contract for a year.

Does that answer your question, Congressman?

Representative COLE. Yes.

Mr. SWISHER. We have no wish to be engaged in ceaseless strife at AEC installations. We certainly have no wish to shut down such crucial operations as are carried on at Arco or at the various gaseous diffusion plants and other installations where we have contracts. Yet, under the present system, what are we to do?

It is our position that there is a solution leading to peaceful, orderly, and mature labor-management relations at these plants.

Our prime recommendation is that the panel be abolished, particularly since there is on it no representation from organized labor and since organized labor had no voice in establishing its procedures.

We recommend in its stead the establishment of a tripartite panel with representation from labor, industry, and the general public. It would be subject to call when disputes are submitted if they cannot be resolved by the normal processes of collective bargaining.

Chairman ANDERSON. For our own guidance, Mr. Smith, do you have any knowledge whether the AEC has considered or is planning to consider a recommendation that the panel be abolished?

Mr. SMITH. No, we have no plans at all.

Chairman ANDERSON. I thought if there had been such a decision on both sides we might be closer to accomplishment.

Mr. SWISHER. We further recommend that representatives of organized labor be picked and subjected to a complete "Q" clearance who can advise a union on the question of whether a strike—should negotiations break down—would really be detrimental to the national interest. We mean no disrespect to any other authorities when we make this recommendation. But surely it is obvious that unions would be more inclined to trust a unionman's verdict on such a problem than either a Government or an industry representative. Where such representatives of organized labor do indicate that a strike would be injurious to the atomic-energy program and the workers agree not to strike, the dispute would be submitted to the tripartite panel mentioned above.

Representative COLE. Mr. Swisher, has it ever occurred that representations are made solely by an industry representative that a certain work stoppage would not be in the best national interest?

I cannot conceive that an industryman would predicate to himself the judgment of whether a work stoppage would be harmful to the national interest or not. Of course, the Government representative would reach such a judgment. I wonder if it has ever occurred?

Mr. SWISHER. To my knowledge it has not, at least in the field in which our union has operated. I do not know of any one of the contractors making such a determination. The determination, of course, has been made by the AEC.

Representative COLE. Previously?

Mr. SWISHER. Yes.

Representative COLE. And the word was passed along to the people in the operation?

Mr. SWISHER. That is right. Then you have the problem that the workers themselves on that particular operation are in conflict with what they know of the operation and their comparison—let me put it this way—of this particular operation to the Nation's critical part of the defense or the best interest of the Nation. That we have in conflict. Basically, part of that conflict on the part of the worker himself comes from the fact that his representative is not allowed to take an overall look or be a party.

Representative COLE. His representative is the one who makes a decision. That is the man in Government. I would think it would be rather unwise for a union to rely solely on one of its own designates to advise them with respect to the effect of a union operation on our national security, because that union representative would not be in a position to have an overall understanding of the requirements of our national security.

When you say that a union representative does not make a decision, it is not a union member who makes the decision. However, actually

a Government representative does make the decision just the same as though he were a union representative and the public representative.

Mr. SWISHER. When you say the workers' representative makes his decision, he is not one of the elected representatives. He is one of the appointed representatives of the Government making the decision. When I say the workers' decision to strike should be predicated on his union representative's decision, I do not mean to convey that. I mean to say that the workers' confidence would be greatly enhanced in his Government representatives were his union representatives allowed the availability of the information on which a decision is made that a plant is absolutely critical to the best interests of our country.

Our workers are loyal. They do not want to interfere with the best interests of our country.

Representative COLE. Is that prerogative or opportunity now being made available to the management representative?

Mr. SWISHER. We feel it is. Naturally, management representatives are cleared. Management representatives are a part of this everyday operation. We, as nonworkers in this industry, but as representatives of our membership, are set aside. Our decision to grant permission to strike is based only on one base of information, and that is the workers' position that a strike is not harmful to the interest of the country.

Representative COLE. Are you sure the management's representative is told by Government people the reasons that a work stoppage would be harmful to the national interest?

Mr. SWISHER. I could not answer "Yes" or "No." I could only assume that management's people would be told by the Commission. Then, of course, you have these conflicting authorities, too. When management says that a plan can be operated for 30, 60, or 90 days while the workers are on strike, how can you resolve the worker's confidence that he himself is right, that it is not going to hurt to shut this plant down when he hears such a statement from his management?

Representative COLE. Of course the management's statement that it would be harmful to the national interest contemplated shutting down of a plant. That is not inconsistent because, aside from the fact that the workers will not go to work, management in some fashion believes it will be able to operate the plant. That does not minimize the decision of the Government or management that a complete stoppage would be harmful. I do not see where the two are inconsistent.

Mr. SWISHER. You and I might agree on that part of it, but considering the people in the plant becomes the problem.

Chairman ANDERSON. You may proceed.

Mr. SWISHER. In such instance, the panel must be empowered to enforce its findings, just as arbitration in any other industry is legally binding on both parties.

We believe this panel should be free to decide the issues involved on the basis of then-prevailing settlements in other industries and that to these settlements should be added an additional figure, if wages are in question, to make up to the workers for voluntarily sacrificing their right to strike.

Should there be no question of a work stoppage, but simply a failure of company and union to agree on terms, the panel could act similarly when the company and the union mutually agree to submit a dispute to it.

Still another point needs to be made in the peculiar relationships existing under the system of private contractors operating AEC installations on cost-plus contracts. That is the fact that these contractors do not have to bear the expense of negotiations or of arbitration out of their own pocket. It becomes another operating cost which they pass on to the Government and the taxpayers, including our members.

The result is that instead of making a determined effort to reach a speedy settlement of negotiations or grievances, these contractors in many cases use this minor windfall as an all-expense-paid method of testing points of labor law and harassing unions. This puts our members, as taxpayers, in the position of financing the fight of private industry against themselves while they must finance their fight out of their union dues.

We believe that this kind of expense should be disallowed in AEC contracts with private firms. We think it will contribute materially to a willingness to resolve disputes early and so reduce tensions that occur naturally enough between unions and management without the incentive of Government subsidy of management's side. Or, as another alternative, the Government should pay the expenses to the union equal to what management charges as an operating cost.

INTERNATIONAL USES OF ATOMIC ENERGY

Here, again, we find ourselves in accord with the basic recommendations of the McKinney report. In fact, it is with a glow of pride that we find many of our own recommendations in the OCAW 10-point program paralleling those of the report.

However, one significant recommendation—to which we are committed irrevocably—is absent from the McKinney panel's report. That is the urgent need for establishing an international agency as a specialized arm of the U. N. in the field of peaceful applications of atomic energy.

We believe that such an agency is fundamental to progress in peaceful applications of atomic energy, for we do not believe that any nation can singlehandedly provide the solutions to the crying needs of the world's peoples in this field.

We make a number of recommendations concerning such an agency, among them:

1. That it should be open to every nation willing to participate, as are other specialized agencies such as ILO, FAO, WHO, and UNESCO. In this connection, we wish to register special concurrence with the separate opinion filed with the joint committee by McKinney Panel Member Walter P. Reuther.

We could not agree with him more when he says:

> Full participation of the atomic have-not nations in the policies and programs of the U. N. agency is imperative and should be provided for.

2. That it should have authority to collect and disseminate information in the field.

3. That it should be authorized to use and distribute supplies of nuclear energy materials and that it should coordinate facilities for research and training, and be responsible for conducting research.

4. That it should set safety standards for workers and for community protection.

5. That it should promote and guarantee the rights of labor organizations in the peaceful atomic energy industry, and, to this end, should include labor representation in its makeup.

6. That it should provide assistance and information only to those nations willing to guarantee, by inspection if necessary, that the programs will not be used for military purposes.

As to the question of bilateral agreements between the United States and other nations, we find ourselves in concurrence with the recommendations of the McKinney panel.

I might add, Mr. Chairman, that if the United States is to take the lead—and I think they should take the lead in this international program—that one of the best ways to prove to the world our belief in power reactors and all of the useful uses of this energy, the most significant way of demonstration would be for the passage and putting into effect the Gore bill, S. 2725, and build and use these reactors in these countries.

MANPOWER

We feel that the McKinney panel did not go far enough in its recommendations as to the means of providing an adequate number of trained scientific personnel to meet the needs of the expansion of peaceful uses of atomic energy.

We again urge the recommendation made in the OCAW 10-point program that legislation be passed by this Congress providing for college and graduate level scholarships to be made available regardless of race, creed, color, or financial condition of the applicant.

We leave the financing of the program to the judgment of the Congress, but we do offer—as one suggestion to offset the cost—charging industries a licensing fee for use of Government-developed patents in the atomic energy field.

We believe it would be an immensely practical way of returning to the public their more than $12 billion investment in the development of atomic energy.

Again, we are putting in a plug on saline water conversion. We feel the neglect of the important topic of saline water conversion by the McKinney panel is an unfortuate oversight. Perhaps it was purposely not included because of the panel's feeling about food surpluses expressed in their recommendation warning about the effect on farm surpluses of radiation deinfestation of grains.

We must raise a note of criticism of a concept so narrow minded when the problem in the world today is not disposal of surpluses, but the problem of feeding the hungry.

But the question of an adequate supply of pure water goes further than its obvious agricultural implications in making arable millions of acres of desert land. It goes to the heart of also making areas literally habitable. Indeed, it can solve the increasing shortage of water for industrial and human consumption in areas already developed.

The major source for such water needs is sea water, and the principal difficulty in the way of providing pure water from sea water at present is the lack of available power.

We urge the committee to recommend legislation to substantially increase the funds now provided for research in the field of saline

water conversion and to provide financing of atomic power salt-water conversion units both at home and abroad when a commercially practical process is developed.

Chairman ANDERSON. As you know I have been very much interested in this subject for a long time and did suggest that we add some money to the saline water work this year and wrote in specifically that it might be done in cooperation with the Atomic Energy Commission and various groups interested in atomic energy.

The item that is on page 311 of volume II, on the distillation of sea water by nuclear energy is a communication which was sent to me and which the panel asked me not to use until they had a chance to incorporate it in this report because they felt it belonged primarily in there. It does suggest, as you may have noted, that a plant could be built that would have the possibility from the point of view of price that was attractive and satisfactory. It does run into a high sum of money, maybe as much as six or eight hundred million dollars for the plant.

The panel did say that it was probably too expensive. This is on page 87 of the first volume.

But the study that Dr. Hammond made persuaded him that if you could find them willing to spend that much money that the operation of the plant would probably be worthwhile. I think I subscribe very fully to that. Therefore, I want to say to you that you will find somebody pushing in the same direction that you are pushing at the present time, because this offers a tremendous possibility all over this country since the consumption of water is going up.

Air-conditioning units and everything else that has come into modern homes has added to the per capita consumption of water. If we could relieve some of the seacoast problems by building an atomic powerplant on the seacoast, I do think we would make some very surprising contributions. For instance, if you did that in Los Angeles you might solve some problems that have been perplexing the State of Arizona for a long time.

Mr. SWISHER. And the State of Colorado, sir.

Chairman ANDERSON. To some degree. The fight between Arizona and California is who gets the Colorado River water that comes down that far. We have problems with the Republic of Mexico. If we could give Los Angeles and the surrounding area a cheap, limitless, inexhaustible supply of drinking water through the use of atomic energy it would be a godsend not only to that community but to all the country.

I do think it is possible. I feel it is closer than some of us realize. So, I am glad to have you mention it at least.

Mr. SWISHER. I am well aware of your position on it, Mr. Chairman. Let me say that at least in us you have a strong support.

ATOMIC POWER

In this field, we would add to the McKinney panel's recommendations, our own recommendation from the OCAW 10-point program:

In addition, public power groups, especially in areas where waterpower is not available and where other fuels are costly, should be given all aid and assistance possible in building atomic power plants. These plants will serve the dual

purpose of providing power in areas that do not now have it, and of providing a yardstick for comparison on costs and rates for distribution of atomic-generated electric power.

Realizing that others would be testifying on the question of power and would have facts and figures and so forth, we dispensed with any lengthy document other than what we just have here.

REUTHER OPINION

We also wish to go on record as concurring without reservation in the separate opinion filed by president Walter P. Reuther, of the United Automobile Workers, AFL–CIO, with the Joint Committee. Mr. Reuther's points, we feel add needed substance to the McKinney report and should be given full consideration by the Joint Committee. There is no need to repeat here the points made in Mr. Reuther's separate opinion, nor to elaborate on them since they are self-explanatory. But we do wish the Committee to understand our unequivocal support for his positions.

SUMMATION

It is the feeling of the Oil, Chemical, and Atomic Workers that the McKinney report performs a valuable service to the American people and the Joint Committee, having established the panel, is obligated to develop legislation in line with the panel recommendations.

We further feel, however, that certain vital matters have been left out of the McKinney report. These ideas outlined in this testimony, in the OCAW 10-point program for peaceful use of atomic energy, submitted earlier to this committee, and in the separate opinion filed with the committee by Walter P. Reuther are equally valid and essential subjects for legislative recommendations by this committee. We sincerely hope that action will be taken to implement them.

Finally, we would like to add our voice to that of the McKinney panel members in urging that the Joint Committee not stop with the McKinney report, but provide for a continuing review of our progress—or lack of it—toward the goal of full utilization of atomic energy in pursuits designed to benefit mankind. No report, not even one as comprehensive as the McKinney report, can provide answers valid for all time.

In the field of atomic energy where even basic concepts, let alone commercial applications, are changing so rapidly, continuing review of our policies and programs is essential to insure that the vast promise inherent in this virtually limitless source of energy be utilized to bring about an ever-increasing standard of living for our own citizens and a chance for a life itself to untold millions of our brothers and sisters throughout the world.

Chairman ANDERSON. Are there any questions?

Senator PASTORE. Only on one point.

Mr. Witness, referring back to page 8 under the general topic of international uses of atomic energy, don't you feel that that negotiation is now in progress? They are meeting here in Washington. As a result a resolution was passed by the General Assembly of the United Nations only this past fall.

Mr. SWISHER. I am well aware that the 12-nation conference is in progress.

Senator PASTORE. It is 14.

Mr. SWISHER. It has increased now. I know at the time this was prepared that conference had been postponed from January to February. And having up to this date heard nothing coming out of it, we still felt that we should put our position forward.

Senator PASTORE. That may be the reason that the McKinney panel report left it out, because it was in progress at that time. I understand strides are being made in that direction. Of course, the process is going to be rather slow, too slow to suit me. I go along with you in the general idea that ought to be pushed as much as possible.

Mr. SWISHER. I think it is absolutely necessary that we push it in view of world affairs.

Chairman ANDERSON. Thank you, Mr. Swisher.

Mr. SWISHER. Thank you, Mr. Chairman.

Chairman ANDERSON. At this point in the record we might put in a letter from the Consumers Public Power District, of Columbus, Nebr., dealing with this problem that they have in connection with insurance. I might read one paragraph of it:

> Before the end of 1956 we expect to be making firm commitments for equipment, not only for the reactor portion of the powerplant but for the conventional portion as well. Such commitments, however, cannot be made until it is definitely known how much insurance will be available on the plant and at what costs. Otherwise, we might find ourselves with an atomic powerplant, involving millions of dollars in construction costs, ready for operation but that operation impossible or impracticable because of insurance limitations.

That is the very point that some of us have been trying to make, that these plants might be built but not operated if this question is not studied and some answer given.

(The letter referred to follows:)

CONSUMERS PUBLIC POWER DISTRICT,
Columbus, Nebr., March 2, 1956.

Subject: Public hearings by the Atomic Energy Joint Committee on the report of the panel on the impact of the peaceful uses of atomic energy

Hon. CLINTON P. ANDERSON,
Chairman, Joint Committee on Atomic Energy,
Room F–88, The Capitol, Washington, D. C.

DEAR SENATOR ANDERSON: In accordance with your invitation of February 17, I am submitting the following comments on the above report in connection with your public hearings scheduled for March 5 and 6. These comments are given in my capacity as general manager of Consumers Public Power District (of Nebraska), which organization has received approval by the AEC for the construction of a 75,000 kilowatt sodium graphite type of atomic power reactor. Negotiations with the AEC are under way on the preparation of the final contract documents, and we anticipate that they will be in final form in the near future.

The panel has made an extensive survey of the field in the brief time they had, and generally I feel that the report performs a valuable service. There are some details with which I am not in full agreement; however, the principal item that disturbs me is in connection with their conclusion on insurance coverage for power reactors.

The panel seems to arrive at the conclusion that the matter of insurance coverage on power reactors is not a pressing problem since there is an interval of 2 to 3 years before these reactors will be placed in operation and the insurance becomes effective. It is true that this time interval is substantially correct so far as the actual placing of the reactor into operation is concerned, but they overlooked completely the fact that until the matter of insurance coverage is solved, it is questionable that private organizations can proceed with their construction plans.

Before the end of 1956 we expect to be making firm commitments for equip-

ment, not only for the reactor portion of the powerplant but for the conventional portion as well. Such commitments, however, cannot be made until it is definitely known how much insurance will be available on the plant and at what costs. Otherwise we might find ourselves with an atomic powerplant, involving millions of dollars in construction costs, ready for operation but that operation impossible or impracticable because of insurance limitations.

In my opinion, the insurance problems must be solved at once, not only as to the amount of coverage but also as to reasonable rates comparable with those for conventional types of powerplants.

I do not condemn the insurance industry for their reluctance to set out details as to coverage and rates, because the risks are indeterminable at this time and the sums of money involved, in my opinion, are very large. I believe the immediate solution is that the Government provide overriding insurance on the risk, due to the nuclear features of the plant, at costs which will permit organizations such as ours to proceed with assisting in the development of atomic powerplants. If this is not done, the alternate appears to be Government ownership and operation of all these power reactors until the risks are full evaluated and the insurance industry is willing to develop adequate coverages at reasonable costs. In my opinion, the latter alternate is not the proper one.

Very truly yours,

R. L. SCHACHT, *General Manager.*

Chairman ANDERSON. Then the American Public Power Association has asked us that a letter dated February 27, 1956, be made a part of the record, and it will be made a part of the record at this point.

(The letter referred to follows:)

AMERICAN PUBLIC POWER ASSOCIATION,
Washington, D. C., February 27, 1956.

Hon. CLINTON P. ANDERSON,
Chairman, Joint Committee on Atomic Energy,
Senate Office Building, Washington 25, D. C.

DEAR SENATOR ANDERSON: Thank you very much for your letter of February 17, 1956, advising us of the hearings to be held on March 5 and 6 by the Joint Committee on Atomic Energy on the report of the panel on the impact of the peaceful uses of atomic energy, and of our opportunity to comment on the report at the hearings.

The American Public Power Association is keenly interested in seeing a vigorous and determined atomic power development program established and therefore we have reviewed the report of the panel on the impact of the peaceful uses of atomic energy with a great deal of interest. Mr. William S. Peterson, vice president of the association, commented at some length on the report when he testified on behalf of the association on February 16 before the Joint Committee on Atomic Energy. I do not believe that we have anything of significance to add to those comments at this time. Consequently, we will not ask to testify on March 5 or 6, although we appreciate your advising us of our opportunity to do so.

I respectfully request that this letter be made a part of the record of the hearings on the panel report, in order to indicate that our comments on the panel report are included in the record of the February 16 hearings.

Sincerely,

ALEX RADIN.

Chairman ANDERSON. Mrs. Parker.

STATEMENT OF MRS. BARRINGTON D. PARKER, LEGISLATIVE REPRESENTATIVE, NATIONAL COUNCIL OF NEGRO WOMEN

Mrs. PARKER. I am Mrs. Barrington D. Parker, and I am a member of the legislative committee of the National Council of Negro Women. We appreciate this opportunity to make a statement. We are not a technical group, but we do represent an affiliation of a large number of women.

The National Council of Negro Women considers the report of the panel on the impact of the peaceful uses of atomic energy an extremely significant document. For a long time the women of this council, like women in all parts of America, and throughout the world, have entertained an interest in and a concern about the future of a society which must live with forces that challenge traditional concepts of control and whose ultimate influences and implementation have not yet been fully conceived—and interest and concern which has often approached apprehension.

It is very gratifying and most reassuring to know that the responsible leaders of our Government share this awareness and are directing their attention and efforts toward a positive resolution of the entire situation.

Although the National Council of Negro Women is appreciative of the tremendous scope of the inquiry by the panel, there are naturally some areas which are of more immediate interest and concern to its membership.

It is particularly important from our point of view that every benefit possible from the most judicial use of atomic-energy information shall be translated into the immediate and personal benefit of individuals and groups in our society. For this reason, the National Council of Negro Women suggests that, in connection with and in addition to the development of research centers and the exchange of information recommended by the panel, specific attention be given to procedures whereby the results of the research and the benefits of the information shall become more immediately available to larger sections of the general public. This is particularly desirable in areas of medical research.

The council feels that such dissemination might involve more decentralization of research project centers, and more grants-in-aid by the Commission and, whereby possible, bulletins of research information to practicing physicians and to medical societies and licensing boards.

We especially appreciate the recommendation by the panel that specific research and development goals in atomic knowledge be established, and we urge most emphatically that priority be given work in areas which will support the goals announced by the panel—work which will establish knowledges and practices which will contribute to the "healthier, longer, more productive lives" described in this report. The National Council of Negro Women urges that development of atomic energy which will raise the level of living standards in depressed or undeveloped areas of our country and of other parts of the world be a coordinate goal with efforts to increase the individual life span, and the council urges with all possible conviction that the results of such research and discoveries shall be fully exploited in a forceful, positive campaign to strengthen the bonds of the free world and to increase its strength in numbers and in conviction.

Finally, we suggest that a definite program be developed for increased understanding of the peacetime atomic energy by the general public. It is the belief of the council that education for public and high-school students, who may not be college bound, but who will nevertheless have to learn to live and work with the atom, is most important.

In line with the limits imposed by the national security, we suggest that a program of popular education be promoted—a program designed to offset or remove the current proclivity to hysteria, and the general association of atomic energy with destruction. The council wishes to endorse the recommendation by the panel for a reexamination of the Commission's present policy toward classification looking toward the release of more nonmilitary information for general use. It is our conviction that a reorientation of point of view and a general clarification of concepts regarding atomic energy is the need most indicated at this time for the general American public and we sincerely hope that the Commission will accept these recommendations by the panel.

Chairman ANDERSON. Thank you, Mrs. Parker. May I commend you for your brevity.

Mrs. PARKER. Thank you.

Chairman ANDERSON. Mr. Olds.

STATEMENT OF LELAND OLDS, HEAD OF ENERGY RESEARCH ASSOCIATES

Mr. OLDS. My name is Leland Olds. I am head of Energy Research Associates, affiliated with the Public Affairs Institute. I was formerly a member and Chairman of the Federal Power Commission, and a member of the President's Water Resources Policy Commission. I appear here today in response to an invitation from the Chairman of the Joint Committee on Atomic Energy to comment on the Report of the Panel on the Impact of Peaceful Uses of Atomic Energy, submitted to the Joint Committee January 30, 1956.

In the first place, I should like to say that the report of the panel, with its companion volume of background material, brings together very valuable data for appraisal of the present status of the Nation's entrance into the atomic age in relation to both our domestic economy and our position of world leadership.

In the second place, I should like to join in recommendations already presented at these hearings by Clyde T. Ellis, general manager of the National Rural Electric Cooperative Association, and William S. Peterson, general manager, Los Angeles Department of Water and Power, representing the American Public Power Association, endorsing certain of the panel's recommendations but emphasizing the urgency of prompt undertaking by the Federal Government of a program of large demonstration reactor construction. I agree with them that, in terms of both the home and foreign stake of the United States in early development of economical atomic powerplants, this is no time to be waiting to see whether private enterprise, so-called, is ready to assume the risk of advancing the art.

For the same reasons, I endorse the separate opinion of Walter P. Reuther, president of the United Automobile Workers, and a member of the panel, who joined in the panel report but feels that the interest of the United States and its people requires a bolder program than the report itself recommends. I think that publication of Mr. Reuther's separate opinion with the panel report would have added to its usefulness as a public document and I respectfully urge the Joint Committee to make sure that it is available for distribution with the panel report.

Finally, I should like to say that I feel Commissioner Thomas E. Murray, of the Atomic Energy Commission, has performed an important public service in presenting to the Joint Committee a program for action by the Federal Government, through the Atomic Energy Commission, which would get the American atomic power program off the ground.

We are now well along in the second year since the Atomic Energy Act of 1954 became law and if one thing has become clear it is that private enterprise is not ready to provide the research and development funds for the kind of progress in the field of atomic power which will keep us abreast of progress in other countries or, as I shall suggest later, of our needs at home.

In a sense, we have spent a great part of the time debating how the Government can provide the bulk of the risk capital while preserving the appearance that private enterprise is ready and able to lead in this great adventure. All we have to do is to couple the various types of subsidy provided through the Atomic Energy Commission, as set forth in the panel report, with the availability of quick amortization tax certificates to realize the extent to which this is true.

Here it might be noted that even in the matter of providing the conventional power capacity required to sustain the huge expansion of the country's economy, private power companies have obtained subsidies, free capital from the people, equivalent to the full investment in something like 8 million kilowatts of powerplant capacity.

As I studied the panel report I became increasingly aware of the fact that United States leadership in the major field of peaceful use of atomic energy is threatened by an unreal debate founded on a mistaken concept of the nature of the electric-power business. That mistaken concept has been foisted on us by a massive utility propaganda campaign, planned by experts and carried on at great expense during the last 15 years.

As a result, we find in public statements and such reports as that of the panel that men responsible for formulating Government policy in one of the most vital areas of American life must beat all around the bush before recommending that the people of America use their own vast public credit to develop power from their own new public resource which was brought into being by huge investment of public funds.

It is this unfortunate misunderstanding which is preventing orders from flowing to the truly private-enterprise segment of the electric-power industry, the equipment-manufacturing segment, to assure the construction of the large demonstration projects which alone will open the way to economically feasible atomic power.

I shall have something more to say on this aspect of the matter in connection with my comment on certain parts of the panel report.

Suffice it to say here that this outlook requires the panel to recommend that the Government move forward into the atomic-power age while constantly looking back over its shoulder at regulated private corporations operating theoretically at cost in the privileged conduct of a public business. It reminds one of the Sabine men who lost to their Roman conquerors because custom required them to march into battle 2 steps forward and 1 step back.

URGENCY OF PROGRESS IN ATOMIC POWER FIELD

The result is an apparent conflict in the panel's mind between an awareness of the urgency of progress in terms of the broad interests of the United States and hesitancy about recommending that the Government move forward boldly to assure such progress. This hesitancy, if it influences the action of Congress, may have very serious consequences for the American private-enterprise system.

For instance, on page 49, the panel makes a very good case for the urgency of prompt development of low-cost atomic power in terms of both expansion of the American economy and our position of world leadership. It says:

> The urgency associated with accepting the challenge to United States world leadership, together with the need for establishing atomic energy as a power resource available to assist in maintaining maximum expansion rates of the American economy, requires that effective development and demonstration of all major reactor sizes and types be carried forward at high priority.

The panel has previously built up the picture of this urgency in terms of expansion of our economy. Thus, it points out, on page 29, that our electric generating capability has more than doubled since the close of World War II and that, if this rate of growth continues over the next 25 years, the atomic power capability of the United States in 1980 could be larger than our entire electric generating capacity today.

Then, on page 36, discussing the contrast between the Electrical World and the Federal Power Commission forecasts of growth of the country's requirements for electric generating capacity, it says:

> The prospect of an indefinitely expanding economy which may require as much as 600 million killowatts of electrical generating capacity or more by 1980 makes it clear that the Commission must explore this nuclear resource in a continuous program as quickly as possible.

And yet we find the panel stating, on page 22, that—

> there is no current urgent need for new sources of fuel for the production of electric energy.

But it follows this with the further statement that—

> our present abundance of other energy resources has not lessened interest in realizing the potentialities of this new source of energy.

It notes that—

> intelligent and consistent effort to develop this new source of power will assure that the growing energy demands of a dynamic and expanding economy will be fully met without the need of resorting to future crash-development programs.

In spite of this picture of urgency, we find the panel stating that the fundamental obligation of the Federal Government for effective development and demonstration of all major sizes and types arises only—

> if progress is not expeditious and efficient.

And then the panel's first recommendation on page 49 reveals clearly the conflict in attitude when it recommends that—

> the Congress, the American people, and the people of the world recognize that * * * years of effort must be spent to bring atomic power to a point where it can be used effectively and widely on a competitive basis.

I am convinced that Congress must recognize effective development of atomic power as a fundamental responsibility of the Federal Gov-

ernment without further waiting to determine whether private enterprise can be depended upon for expeditious and efficient progress.

FEDERAL PROGRAM STIMULATES PRIVATE PARTICIPATION

By this I do not mean to preclude private participation. The more we have of it the better. The field is broad enough for Federal, non-Federal public, cooperative, and private participation. In fact, experience during the last 20 years has shown pretty conclusively that the country will get more vigorous private participation if the Federal Government is in the picture as an actual or potential competitor.

We must not overlook the fact that the doubling of the country's electric generating capacity since World War II, referred to by the panel, was due in very considerable measure to Federal Government action along two lines.

In the first place there has been the stimulus to the privately owned segment of the power industry, which has come from the Federal hydro program, coupled with the more recent construction of big modern steam electric stations by the Tennessee Valley Authority. I would call the committee's attention to the recognition of this fact by the panel.

The panel, on page 41, says that it can conceive of developments in atomic power "which could result in prices below those now paid for electricity from any conventional plant." It says further "the stimulating effect of such low-cost power on the use of electricity" could also be a force in continued rapid growth of the economy of the Nation. It then continues:

> We have examined the thesis that the possibility of low-cost atomic power might change the character of the utility industry by providing a competitive yardstick and stimulant to very rapid growth of demand and generating capability. It is our belief that the effect of low-cost atomic electricity on the utility industry will be no different than has been the effect of low-cost electricity from other energy sources, such as waterpower. While these developments have provided a starting point for new economic expansion and a stimulant to conventional generation at lower prices, we do not see radical change in the character of the utility industry directly attributable to these developments. * * *

This committee is entirely familiar with the competitive influence of the big TVA steam plants, built in connection with TVA's huge commitments to the Atomic Energy Commission, as a stimulus to the undertaking of such big low-cost privately owned steam electric powerplants as those constructed by Electric Energy, Inc., at Joppa, Ill., and by Ohio Valley Electric Co., near Portsmouth, Ohio. And I think history will show that recent progress in steam-plant economy, which figures in the panel report and its companion volume, was a result of this stimulus as well as the nascent competition of atomic power.

In this connection it may be noted that between 1933 and 1952, while the generating capacity serving the TVA area increased 500 percent and that of the private companies in the eight States adjoining Tennessee increased 200 percent, the generating capacity of the private companies throughout the rest of the country increased less than 100 percent. To put the matter another way, by 1954 the generating capacity in the TVA market area amounted to about 5 kilowatts per customer and that in the Bonneville Power Administration

area to about 3¾ kilowatts per customer, as compared with slightly under 2 kilowatts per customer for the rest of the country.

The second line of Federal action, which has played an important part in stimulating the doubling of the country's electric generating capability since World War II, has taken the form of the huge subsidies for private power company construction, to which I have already referred, provided through quick amortization tax certificates. As noted by William S. Peterson, who appeared at these hearings on February 16 on behalf of the American Public Power Association, a study prepared for the panel by the United States Treasury Department referred to this particular type of financial inducement as—

> equivalent to an interest-fee loan from the Treasury on the postponed (tax) payments.

And Dr. Clay Cochran, on behalf of the National Rural Electric Cooperative Association, told you that net interest-free loans to private power companies through January 25, 1956, had already reached $1.2 billion.

Perhaps the most significant fact in connection with this form of Federal stimulus is that, when in 1954 the Defense Plant Administration temporarily discontinued authorization of certificates entitling power companies to such interest-free loans from the Federal Treasury, the volume of orders for future additions to generating capacity suddenly fell off. The subsidy plan was revised.

In the light of these facts, based largely on the panel's own analysis, I urge that Congress authorize and direct the Atomic Energy Commission to take responsibility for the prompt construction of a number of large demonstration atomic power plants. From my continuing studies in this field, I am convinced that, if this decision is made, there will be no need for the curious recommendation, already quoted, that—

> the Congress, the American people, and the people of the world recognize that * * * years of effort must be spent to bring atomic power to a point where it can be used effectively and widely on a competitive basis.

Somehow, as I watch what is going on in Europe and in Japan and in Russia, I do not believe that the other peoples of the world are going to accept passively the idea that years must elapse before atomic power is competitive. If this is so, that recommendation will indeed prove ill-advised as a guide to the American people.

I have already noted the reference of the panel to the stimulating effect which low-cost atomic power might have on the "continued rapid growth of the economy of the Nation."

As we enter a period in the rivalry between the two major divisions of the world, in which there is practically unanimous agreement that the struggle is to be economic not military, the significance of this reference should not be overlooked. It bespeaks the importance of a dynamic Federal atomic power policy, in which the Federal Government goes unhesitatingly forward developing low-cost power in abundance from this Government-owned resource.

I think that traditional American thinking, uninfluenced by the monopolistic outlook of some powerful vested interest, would never hold that "there is no current, urgent need for new sources of fuel for the production of electric energy" if lower-cost fuel in great abundance was just around the corner.

THE PANEL POINTS TO A SPECIFIC NEED IN THIS COUNTRY

I have already noted the panel's statement that the tremendous power requirements of an indefinitely expanding economy make it clear—

that the Commission must explore this nuclear resource in a continuous program as quickly as possible.

Subsequent discussion in the report pinpoints a subhead under this broad mandate which I should like to take a minute to highlight, particularly in terms of its importance to American farmers and their rural electric cooperatives.

On page 47, under the caption "General Impact Considerations," the panel expresses the judgment that nuclear fuels—

(1) will almost certainly compete and very possibly make posible lower power costs than conventional fuels in present high-cost power areas; and (2) will probably at least compete with conventional fuels for power generation in all areas except those in which fuel transportation costs are negligible.

The panel states further:

The trend that results from such a generalized forecast is toward the equalization of power costs at lower levels in all areas (p. 48).

The panel attempts to interpret this entirely in terms of industrial patterns, seeing the equalizing cost trend brought about by the advent of atomic power as contributing to industrial centers, as well as to bolstering economic expansion.

When we combine this with the at least equal importance of the fact that the advent of atomic power will equalize the cost of power among the 1,000 rural electric cooperatives supplying about 4 million farms with this modern form of energy, we recognize the tremendous contribution this new power resource can make to the health of our national body, economic and politic. We cannot allow a mistaken conception of the nature of the power business to delay the consummation of this new development.

The Federal power program based on multiple-purpose river-basin development and the rural electrification program are really parts of the same program. Thus, in 1934, less than 11 percent of the country's farms had electric service, with the percentage down to 5 percent or less in the Southeastern States from Virginia and Kentucky to Florida, Georgia, Alabama, and Mississippi, as well as in the Southwestern States of Arkansas, Oklahoma, Louisiana, and Texas. In the great agricultural States, extending north from the Arkansas-Oklahoma line, only 8 percent of the farms enjoyed the blessings of electricity.

In comparison, today approximately 95 percent of all the country's farms get electric service, and the percentage is averaging in the neighborhood of 90 percent in practically all of the States of the Union. Either the availability of power generated at Federal dams, or the prospective availability of such power, or its competitive influence on the wholesale power supply rates offered by private power systems was an important factor in assuring rates low enough to make service to areas with few farms to the mile economically feasible.

But, because waterpower resources are not equally distributed among the different areas of our country or because private power companies were able to block Federal programs in certain regions, the advantages of low wholesale power costs have been very unequally distributed

among the rural electric cooperatives. The range today is actually from about 3½ mills per kilowatt-hour in the Bonneville Power Administration area to 15 mills per kilowatt-hour in the State of Maine.

Today, America's farms are on the threshold of the next stage in the rural electrification program, in which electricity will not only make possible a modern farm home but also modern electrified farming operation on a scale scarcely dreamed of when extension of electric service to all farms was first undertaken. This is going to be of great advantage to the economical operation of the farm, as well as to the financial strength of rural electric cooperatives. And an unlimited supply of wholesale power at a stabilized low cost is of major importance to this next step.

When we accept estimates which places the power requirements of the country at 600 million kilowatts in 1980, or about 6 times the requirements of 1955, we are apt to interpret this huge figure in terms of necessary and desirable industrial expansion, providing full employment with a shorter workweek and a higher standard of living.

But the General Electric Co. tells us that, before 1980 is reached, total residential requirements will be exceeding total industrial consumption and the entire electrical industry is considering the rebuilding of residential distribution systems for such heavier average use of electricity. The use of atomic energy for space heating, which the panel finds unlikely in terms of replacing the conventional air or gas space heating of today, will very probably come as electrical space heating with power from atomic, as well as conventional fuel and hydroelectric, power stations.

In terms of rural electrification, you must add the economies and conveniences of the electrified farm operations, saving manpower, feed, number of pigs raised per litter, and the quality and quantity of hay, grain, and feed output. Examples of electrification of farm operations which is proving that it pays off include:

(1) Complete electrification of dairy barns with electric feed handling, electric milking, electric cooling, and other care of milk, and electric barn cleaning.

(2) Complete electrification of poultry operations from the brooder to the delivery of the eggs, graded, air-conditioned, and boxed.

(3) Complete electrification of the brooding and fattening of hogs, including infrared lights insuring survival of at least one more pig per litter; and air-conditioning of the hogs assuring more rapid fattening and materially reduced feed per pound of weight.

(4) Electric chopping and handling of silage, grinding, and mixing of feed, cutting and curing of hay, drying of grain, and so forth, assuring retention of maximum nutriment in hay and harvesting of grain at the top of its quality.

(5) Supplemental irrigation to free crops from the uncertainties of rainfall at the time when required for optimum development.

There are many other labor-saving and quality-preserving uses of electricity depending on the characteristics of the modern farm, including stock watering and the farm machine shop for maintaining all the equipment.

I have suggested these illustrations because, in dealing with the vital subject of the impact of atomic power on the various aspects of American life, there is a tendency to think mainly in terms of the

importance of low-cost power to industry, to the increasingly important electroprocess industries, to energize automation, and generally to provide the 14 kilowatt-hours per man-hour of labor which will be required by industry in 1970 as compared with less than 8 kilowatt-hours today and less than 3 kilowatt-hours during the 1920's.

What I want to emphasize is that abundance of low-cost electric energy is equally vital to the prosperous operation of our farms. And, where the number of farms served by a given rural electric cooperative may run as low as 2 or 1, or even less, per mile of powerline, low-cost power supply becomes a matter of critical importance to the maintenance of rates which will permit these larger uses of electricity.

On the basis of this brief analysis, it seems clear that the national interest requires pushing the development of atomic power as rapidly as possible toward the goal of energy comparable in cost with the best hydro. As a means to "the equalization of power costs at lower levels in all areas" this national interest is as urgent for domestic purposes as it is for the purpose of maintaining our world leadership. And perhaps its greatest domestic importance will be found related to the solution of farm cost problems, particularly in those great agricultural regions where low consumer density and high transportation costs for conventional fuels would otherwise deprive rural electric cooperatives and other power systems of the advantage of low-cost power from giant high pressure, high temperature steam stations located close to the source of coal or natural gas or lignite. I think that is going to be particularly important in the New England situation.

In this connection it should be noted that atomic power will ultimately share with hydroelectric power the characteristic that its major cost will be in fixed charges rather than in operating costs. As shown in the Charpie memorandum contained in the background material volume of the panel report, atomic powerplants may be expected ultimately to have zero fuel costs. This means that the difference in cost of money between Federal atomic powerplants and privately financed atomic plants of the same technical characteristics will mean a considerable saving in the cost of power.

The cost data appended to Mr. Reuther's separate opinion shows clearly that, even on relatively conservative assumptions as to progress in atomic power technology, federally developed atomic power could, within a few years, equalize the cost of power supply to rural electric cooperatives at levels which would enable their managements to offer rate schedules low enough for the farms of the country to share fully in the electrical age.

Closely associated with this necessary approach is the equally important one of expediting progress in the development and demonstration of small and medium-size atomic powerplants. These would constitute supplementary or an alternative source of low-cost power supply for rural electric cooperatives. The panel briefly notes this as an important phase of the Government's responsibility.

IMPORTANCE OF CONTINUED FEDERAL OWNERSHIP OF SPECIAL NUCLEAR MATERIALS

On page 13 and again on page 131 of the panel report there is a disturbing suggestion that ownership of special nuclear materials,

essential ingredients in nuclear fuels, should eventually be turned over to private interests. Thus, on page 13, the report says:

> Ownership of all special nuclear materials by the Federal Government is now desirable and useful, but at some future time the factors motivating such Federal ownership may change. We would expect that continuing review of this statutory finding would result in its abandonment at some future date.

The panel then proceeds to recommend—

> that the Joint Committee on Atomic Energy create statutory devices to insure a continuing review of the present policy of Federal ownership of all special nuclear materials in anticipation of the establishment of private ownership.

Finally, on page 131, we find the panel acknowledging that, with few power reactors, there would be no present market for special nuclear materials if private ownership prevailed. It then continues:

> As the number of atomic powerplants increases, a market for the byproduct plutonium or uranium 233 for use as reactor fuel will undoubtedly develop, thus a degree of inherent market stabilization will come into existence. When that time does arrive, the policy of public ownership should be reexamined.

It appears that the panel was considering this question of continued Federal ownership of special nuclear materials—atomic fuel—more in terms of the ultimate feasibility of allowing this new energy resource to take its place in the conventional fuel market than in terms of the public interest in a new resource brought into being by a tremendous mobilization of public funds.

In simplest terms, the question involves an energy resource which is owned by the Federal Government, described in 1954 as a part of the public domain. The fact that it is today entirely Federal property affords solid constitutional ground for Federal development of atomic power to the extent desired by the people and for the transmission and disposal of that power under conditions such as Congress has established for the marketing of power from Federal river-basin projects.

This also affords a sound basis, in connection with Federal licensing of its use, for attaching conditions which would preclude capitalization of savings in the cost of generating atomic power as compared with equivalent power generated with conventional fuels.

Today, with ownership of this now energy resource, the Federal Government has somewhat the same jurisdiction over its use as it exercises through the Federal Power Commission over non-Federal use of waterpower resources. Under the Federal Power Act, licensees for waterpower development can claim no more for ratemaking than their net investment in the project. The act specifies that—

> such net investment shall not include or be affected by the value of any lands rights-of-way, or other property of the United States licensed by the Commission under this act, by the license or by goodwill, going value, or prospective revenues; nor shall the values allowed for water rights, rights-of-way, lands, or interest in lands be in excess of the actual reasonable cost thereof at the time of acquisition by the licensee (sec. 14).

During the holding company era, there were numerous instances in which power companies capitalized waterpower rights in one way or another, thus enabling the owners rather than consumers to get the benefits of the lower cost power offered by hydroelectric resources. Through many accounting cases, the Federal Power Commission required the companies to write off these excess values.

If private ownership of special nuclear material should become the rule, any saving in cost of nuclear power, as compared with power generated with conventional fuels, could be absorbed by the price charged by the producers of this new fuel on much the same principle as oil interests advanced to support the proposal to amend the Natural Gas Act. Its price would be determined not by cost of production but by competition with other fuels.

It should be noted that we are here dealing with something more than the possible future sale of plutonium produced as a byproduct of the operation of privately owned power reactors. We are on the threshold of the general use of what is at present a new and highly advantageous fuel which will first supplement and, as exhaustion of economically recoverable reserves is approached, propressively take the place of today's conventional fuels for many purposes.

Thus we must envisage the possibility of a great atomic fuel industry, corresponding in its setup in many ways with the extraction and refining activities of the oil industry. And there are already indications that the oil interests themselves are moving into this competitive field. In this connection, I would refer to the paper on The Impact of the Peaceful Uses of Atomic Energy on the Petroleum Industry, by Wallace E. Pratt, at page 89 of the panel report's "Background material" volume.

Mr. Pratt states that "the petroleum industry does not anticipate any disturbing impact from the advent of atomic energy" but "welcomes atomic energy as a partner as well as a competitor." He then points out that—

> A number of alert oil companies have themselves entered the new field and are already engaged in search for uranium ores.

Mr. Pratt goes on to assert that the petroleum industry "believes that atomic energy should be vigorously developed." But, he adds, "it believes also that it should be developed by private enterprise." And he specifies that "Government research on peaceful uses of atomic energy should be placed on a par with its research on conventional fuels." He then continues:

> Toward the oil and gas industries, Government should maintain an attitude which recognizes that, together with coal, oil shale, waterpower, and atomic energy, petroleum resources constitute the base on which the dynamic character of our economy chiefly rests * * * (p. 102).

He urges that the Government

> should strive to provide a political environment which will stimulate energy resources, including oil and gas, to compete freely with each other.

In other words, looking to the future, the suggestion of eventual private ownership of special nuclear materials means that atomic fuel would take its place with oil, natural gas, and coal in the so-called free fuel market.

Now, we know very precisely what this would mean so far as the consumer of atomic energy, either in the form of electricity or in some other form, is concerned. For, in connection with the long battle to exempt the field prices of natural gas from Federal Power Commission regulation, we have heard it reiterated that the price charged by producers should reflect its intrinsic value, rather than cost of production. In other words, the argument is that the price

should be determined by what consumers are willing to pay as measured by what they must pay for alternate fuels.

Without raising the issue as to whether those who would amend the natural gas act are right or wrong, the fact is that, allowing special nuclear material to find its price level in the so-called free fuel market would mean that most of the cost advantages which might otherwise flow to consumers in lower prices for electricity or other energy service, would be absorbed by the producers in prices which would put this new form of energy approximately on a par with conventional fuels.

Today big oil companies are also big producers of gas and thus control two otherwise competing fuels. Let us assume, as Mr. Pratt suggests, that they are investing the large funds available annually from depletion allowances not only in exploration for more oil and gas but also in uranium and thorium production. Ultimately, if special nuclear materials are opened to private ownership, we would unquestionably see them creating an integrated atomic fuel industry from the mines to the free fuel market. And, with a number of these corporations controlling the supply of three competing fuels, we might well see the broadening of the Interstate Oil Compact Commission and the Connally Hot Oil Act to prevent the development of any serious price cutting in this broadened energy field, all in the interest of conservation.

If this should prove to be the ultimate result, the people might well awaken to find all the advantages of an atomic technological breakthrough to much lower cost power diverted to the coffers of private producers of special nuclear materials, despite the fact that the very resource itself has come into being through huge public investment. And it must be borne in mind that ultimately this new form of energy will be used not only for the generation of electric power, but also for propulsion of naval and merchant ships, railway locomotives, airplanes, and even automotive vehicles, as well as for industrial process heat.

So I would warn this committee that the recommendation of the panel "that the Joint Committee on Atomic Energy create statutory devices to insure a continuing review of the present policy of Federal ownership of all special nuclear materials in anticipation of the establishment of private ownership" will not be found to serve the public interest.

PANEL OVERLOOKS PUBLIC NATURE OF POWER BUSINESS

At the beginning of my statement I suggested that confused thinking as to the nature of the power business has handicapped the panel in coming forward with the forthright recommendations which the urgency of the international situation and the public interest in equalizing of power costs at low levels throughout the Nation call for. I want to discuss this in somewhat more detail.

On page 1 of the report, under the caption "Atomic Power," the panel says:

> Private enterprise should carry a substantial part of this research and development, including especially the construction of full-scale "demonstration" plants.

This raises the question, insofar as the application of atomic energy to electric power production is concerned, why the Government should necessarily depend on private enterprise to carry a substantial part of the research and development. Has the panel overlooked the fact that such research and development is to be directed at prompt use of public property for an essential public purpose?

Then, on page 13, the panel makes a questionable recommendation that the Atomic Energy Commission finding of "practical value," as a prerequisite for the issuance of licenses for private atomic projects under section 103 of the act, be narrowed so as to open the way to the obtaining of such licenses before a showing of economic feasibility has been made. The finding is required by section 102 of the act which reads:

> Whenever the Commission has made a finding in writing that any type of utilization or production facility has been sufficiently developed to be of practical value for industrial or commercial purposes, the Commission may thereafter issue license for such type of facility pursuant to section 103.

The panel recommendation would define "practical value" as involving merely technical rather than economic considerations.

In discussing this question on pages 132 to 135, the panel finds it worth noting "that the 1954 act which ostensibly opens up development and application of peaceful uses to responsible private investors does not, in fact, give anyone the uncontrolled right to engage in such activities." It finds the effect of these provisions "contrary to the stated objectives of the act" and continues:

> They constitute an interference by the Federal Government in the right of a private investor to risk his own money, even to go broke, if he chooses to do so.

After some further discussion of the rights of private investors to act on their own initiative and make their own demonstrations of economic feasibility, the panel says:

> Despite recognition of the fact that there is no evidence of anyone now being injured by the licensing provisions of sections 103 and 104, the principles involved in these sections, in our opinion, conflict with the principle of private enterprise which the 1954 act has been represented as advancing (p. 134).

Here again the panel overlooks the fact that, in dealing with the development of atomic electronic power, the questions involve a field of public rather than private business, even though in this country the business today is widely carried on by private corporations.

The fact is that under the law a utility business is differentiated from the general run of private business. It is recognized as a public or public service business whether it involves water supply, or gas service, or rapid transit or telephone and telegraph service, or railway service, or electric service.

As the United States Supreme Court said in the case of *Olcott* v. *Supervisors* (16 Wall. 695), a case involving a railroad:

> Whether the use of a railroad is a public or a private one depends in no measure upon the question who constructed or who owns it. It has never been considered a matter of any importance that the road was built by the agency of a private corporation. No matter who is the agent, the function performed is that of the state. Though the ownership is private, the use is public.

More recently, in his Southwestern Bell Telephone opinion, Mr. Justice Brandeis said that the—

company is the substitute for the state in the performance of the public service, thus becoming a public servant (262 U. S. 276, 291).

This view has been reaffirmed in other cases and applies equally to all businesses carried on under a public grant of privileges. An attorney member of the last Hoover Commission Task Force on Water Resources and Power, Donald R. Richberg, testifying in 1930 before the New York State Commission on Revision of the Public Service Commissions Law, said:

1. The furnishing of public-utility service is not a private business and those engaged in its are public agents performing a function of the state.
2. This doctrine has been long established in the construction of public highways and the operation of railroads.
3. Among the recognized bases for determining what is essentially a "public business" as distinguished from a "private business" are: (1) public grants of privileges; (2) monopolistic restrains on competition; (3) economic dependence of the community on the service.
4. Under modern conditions the furnishing of either transportation, communication, light, heat, power, or water is essentially a "public business."

The fact, that the development of atomic power will be predominantly a part of a public business and that the corporations seeking section 103 licenses for such development will be public service corporations, generally subject to public utility regulation, renders the panel's recommendation, that the Atomic Energy Commission preliminary finding for such licenses be limited by law to technical feasibility, unsound. In fact, in terms of the electric power business, the panel's reasoning, as to "the right of a private investor to risk his own money, even go broke, if he chooses to do so," is unrealistic.

The public cannot afford to let corporations performing such public functions "go broke" or even to earn less than is required to enable them to attract the necessary new capital to expand their service as the need of the community or the country grows. That is the fundamental basis for the theory of a fair return. Actually, all utility service should be rendered at cost, including the actual cost of providing the necessary capital. Rather than permit the utility investors to go broke, the regulatory body would allow increased rates. So any increased costs would be charged to consumers. And this committee has already heard company testimony of their intent to charge atomic development costs to operating expenses, as well as of their insistence on an official ruling that such expenses are deductible for taxes.

The public interest in electric power requires that consumers shall always be able to buy their electricity at the lowest cost consistent with good, dependable service. For this reason, in connection with the issuance of licenses for hydro development, the Federal Power Commission always evaluates the resulting increment in a company's power supply in terms of the cost of equivalent power supply from alternative sources.

Finally, in spite of the panel's tendency to look on the development of the atomic industry, and particularly atomic power, as if it were necessarily a field for private enterprise, we find on page 25 of its report, under the caption "Fnancial Inducements," the conclusion that a wide range of Federal subsidies are going to be required to foster the growth of this industry under private auspices. The panel says:

Few peaceful uses of atomic energy have as yet any demonstrated profitability. The investment required in research and development frequently ap-

pears to be large, and the time necessary for profitable completion lengthy. The growth of private atomic industry can therefore be influenced through direct and indirect financial inducements offered by the Federal Government.

The panel then lists these inducements as including tax advantages, Federal Government financing of vital research and development, waivers of charges for special nuclear materials, placing of Government orders for atomic products and services, and assurances of firm future prices for atomic fuels and for production of special nuclear materials in licensed plants.

This sounds like a far cry from the traditional American private-enterprise approach. Of course, what it means is that large public funds will have to be invested in the development period to provide the orders which will enable the electric-equipment manufacturers to start producing commercial-size demonstration projects. And it is only the mistaken concept of the nature of the power business, fostered by 15 years of misleading propaganda, which is holding back the use of these public funds to construct large Federal atomic-power projects.

RECOMMENDATIONS

In approaching my suggestions as to what the panel should have recommended, I repeat, we are dealing with a great new energy resource which is public property, and we are proposing to use it in all-important public business. When both the resource is publicly owned and the business to which it can be devoted is a public business, there would seem to be no good reason why the people should not use their own low-cost credit to assure the desired progress, as well as to strengthen the competitive portion of the business which is conducted by public and cooperative distribution agencies.

From this point of view, I recommend that the Congress set as a major goal of the country a peacetime atomic program, not a slow achievement of competitive atomic power, beginning in high fuel-cost areas, but atomic power which will equalize power costs at lower levels in all parts of the country.

My analysis of the memorandum prepared for the power seminar and the accompanying memorandum of Robert Charpie, of the Oak Ridge National Laboratory, both found in the panel report's basic materials volume, convinces me that this goal can be attained within a very few years if the Federal program is directed to achieve it. And we should not overlook the fact that a saving of 1 mill per kilowatt-hour on only a quarter of the electricity this country will be using by 1960 would provide the carrying charges on an investment of some $3 billion in developmental work alone.

To give the program this direction will call for amendment of the panel's statement, on page 14, that—

> Investment of Commission research and development money in both small and large private demonstration atomic powerplants seems to us to be sound national policy.

It should be amended to include Federal, local public, and cooperative plants, as well as private demonstration plants.

I recommend, therefore, that the Congress authorize a well-articulated Federal atomic-power program, including Government construction of major atomic powerplants. This would be designed both to maintain our world leadership in this new application of science

to serve the needs of man and to equalize the cost of power supply, particularly to local nonprofit electric systems, in all parts of the country by marketing the power in accordance with the traditional power policy established by Congress in connection with Federal waterpower development.

To give effect to this broad recommendation and assure a Federal atomic-power program which will attain these important national goals, I recommend the following specific steps:

1. Enactment of a bill substantially in the form of S. 2725, introduced by Senator Albert Gore at the first session of this Congress, authorizing and directing the Atomic Energy Commission to construct six large demonstration atomic powerplants. These demonstration projects should be located as steps in a continuing program to equalize and stabilize power-supply costs at the lowest possible levels, with particular consideration for public and cooperative electric systems.

2. Amendment of the Atomic Energy Act of 1954 to make clear the intent of Congress that such a Federal atomic-power program shall be undertaken as one of the major objectives of Government policy. The necessary amendments should include:

(*a*) Insertion in section 2 of the following additional finding:

In achieving the maximum contribution of atomic energy to the general welfare it is essential that the United States, through its own agencies and through other agencies, public and private, undertake a comprehensive program for the production and disposition of nuclear electric power.

(*b*) Insertion in section 3 of the following additional purpose:

A program of governmental and nongovernmental production and disposition of nuclear electric power so directed as to make the maximum contribution to the general welfare, particularly through equalizing power-supply costs at the lowest possible levels throughout the country.

(c) Insertion in section 25 of a statutory requirement that the Atomic Energy Commission set up a Division of Civilian Power Application, correlative in importance with its Division of Military Application, with responsibility for the Federal atomic-power program.

(*d*) Insertion of a new section 28, establishing an Electric Power Liaison Committee, correlative in importance with its Military Liaison Committee, to advise with the Division of Civilian Power Application, with particular emphasis on coordination of its activities with other Federal agencies having responsibilities in the field of power. The Electric Power Liaison Committee should include representatives of the Department of the Interior as Federal power marketing agent, the Rural Electrification Administration, the Tennessee Valley Authority, the Corps of Engineers, and the Federal Power Commission.

(*e*) Insertion of a new section 45, substantially in the form of an amendment passed by the Senate in 1954, authorizing and directing the Atomic Energy Commission, by itself or in cooperation with other Federal agencies authorized to develop or to market electric power, to undertake Federal atomic-power development for the supply of Government agencies, defense industries, public and cooperative electric systems, and private electric systems, with the power marketed in accord with section 5 of the Flood Control Act of 1944, providing for the marketing of power from Corps of Engineers projects.

(*f*) Insertion in section 183 of a new subsection (e) providing that—

every licensee under this act, holding a license under section 103 for a utilization or production facility for the generation of commercial power, shall be subject to the regulatory provisions of the Federal Power Act applicable to licensees under that act, as established by sections 301, 302, 304, and 306 thereof, and to such other provisions of the Federal Power Act as provide for the enforcement of the regulatory authority of that Commission with respect to licensees for development of waterpower.

3. Appropriation of increased funds for the Atomic Energy Commission for the fiscal year 1957, based on estimates of the cost of initiating the six large demonstration atomic powerplants for completion not later than 1959, together with additional funds required to assure rapid progress in a small atomic powerplant program undertaken in cooperation with public and cooperative electric systems and the Rural Electrification Administration.

These recommendations are in line with the recommendations I presented to this committee at its 1954 and 1955 hearings.

In those hearings, I emphasized the importance of bringing the development of atomic power under the traditional power policy of the Nation as worked out over the years at local, State and Federal governmental levels.

I pointed out that this policy rests squarely on the right of American communities to choose public or cooperative ownership of their electric systems as an alternative to the operation of such public business by privately owned corporations. I cited examples of the effectiveness of such public or cooperative competition in supplementing conventional utility regulation and in checking the tendency of regulated private monopoly to maintain high rates which restrict full use of electricity.

I emphasized that, as a result of technical progress, low-cost power supply is no longer a possibility for most local municipal and cooperative electric systems without Federal partnership in the wholesale power supply field. And I recommended the undertaking of a Federal atomic power program as an extension of the partnership which, for many years, has been based primarily on power from Federal river-basin programs.

Since my last year's statement the need for such a programs has become more apparent, while the information compiled at the request of the panel has served to emphasize the possibilities now open to the American people. Yet the panel itself has completely overlooked this essentially American aspect of the task submitted to them.

We are not dealing with an abstract question of simply winning an Olympic race for world leadership in a field of applied science. We are dealing with what may well be considered the lifeblood of great competing economic systems. Those economic systems are, in fact, expressed in agricultural activities, industrial activities, transportation and distribution activities, and even financial activities, which are increasingly dependent on low-cost electrical energy for their modern operation.

Last Sunday's New York Times story of the scope and nature of Soviet Russia's plans to capture world leadership in the atomic power field adds weight to what I am saying.

So, I close by reiterating my recommendation for a Federal atomic power program which, as rapidly as possible, will serve to equalize power supply costs at lower levels throughout the country.

Through such an achievement we will place ourselves in a stronger position to lend a helping hand to presently less-favored peoples. But even more, we will strengthen all phases of our economy and demonstrate, as we did through the great Tennessee Valley program, the dynamic capacity of democracy to develop both the techniques and the institutions which enable the people to make the most of their resources.

Senator PASTORE. (presiding). Thank you very much, Mr. Olds. Would you care to comment at all on the insurance aspect of this whole problem as far as it affects participation on the part of private industry?

Mr. OLDS. Yes; I can say a word on it. I noticed in Nucleonics a report of what is going on in Belgium and the plan of Belgian business to set up a reactor powerplant which will be engineered for them by Westinghouse. They have decided that the risks associated with such an atomic powerplant are today so low, and the present cost of insurance so high that they are actually going ahead with it without seeking insurance, even though it is going to be set up in connection with some kind of trade fair that they are proposing to have several years hence in Belgium.

I also noticed, in Nucleonics I think, that there were already proposals in this country for in a sense, sharing of the insurance liability in connection with these plants among the general liability companies, the fire insurance companies. I think, as I recall it, the general liability companies are ready to insure one of these plants up to $50 million. The fire insurance companies are willing to take another liability of $50 million. I think there is another phase of insurance that would add another $10 million. Today the thing is moving toward a situation where any one of these projects can get a combination of insurance that will take care of liabilities of something over $100 million.

I think that indicates pretty much that the insurance business is taking care of this insurance, and at the same time, as I study the whole situation, the general view is increasingly that these projects are not going to involve any much greater liability than is true of other projects that have been characteristically insured in the United States. All the latest information that I pick up from my reading indicates there is a steadily reduced sense of the hazards involved, and of what is necessary to protect against hazards. That is going to be one of the factors that will reduce the ultimate cost of these projects because you won't have to put in so many safeguards as you had to at the beginning when people were not sure just what hazards were involved.

So it seems to me that, in general, the insurance business is moving to take care of what liabilities there will be in connection with these projects.

There is one thing I would like to add. If delays are being occasioned by a lack of definite settlement of the insurance question, one of the ways to meet it is for the Federal Government to go ahead with these projects, because the Federal Government is a self-insuring organization. It represents the people of the United States, and they can well take the risk of going forward with the big projects that would advance this important art.

Senator PASTORE. In other words, your position is that weight is lent to your position that the Government should participate in this

field to a greater extent, if this insurance problem is going to be an obstacle to private industry going forward as it should.

Mr. OLDS. I think that would be one of the reasons. There are more fundamental reasons.

Senator PASTORE. I realize that. Thank you very much, Mr. Olds.

We will recess now, until 2 o'clock this afternoon in this room.

(Thereupon at 12:50 p. m. a recess was taken until 2 p. m. the same day.)

AFTERNOON SESSION

Chairman ANDERSON. The committee will come to order.

I think after some discussion between the people this afternoon, we will start with Mr. Sporn and then go to Mr. Lindseth.

Mr. Sporn, if you will state your name and your connections, we will start right off with your testimony.

STATEMENT OF PHILIP SPORN, PRESIDENT, AMERICAN GAS & ELECTRIC CORP., PRESIDENT, NUCLEAR POWER GROUP, INC.

Mr. SPORN. All right, sir.

My name is Philip Sport and I am chief executive of the American Gas & Electric Co., and that represents one of the large integrated electric utility systems of the country.

I am also president of the Nuclear Power Group, Inc., which is well known to the committee.

Chairman ANDERSON. Do you not have some connection with one of the plants now operating for the Atomic Energy Commission?

Mr. SPORN. I am president of the Ohio Valley Electric Corp. which is supplying all the power requirements of the Portsmouth project of the Atomic Energy Commission.

I want to thank the committee for inviting me to appear today to comment on the panel report on the impact of the peaceful uses of atomic energy.

At the outset I should explain that, in addition to holding the position of chief executive of the American Gas & Electric System, which is one of the large integrated electric utility systems in the country, I am also president of Nuclear Power Group, Inc.

Your committee is well aware of NPG's part in the 180,000-kilowatt boiling water reactor plant which is going ahead near Chicago. As you know, this work is under the joint auspices of Commonwealth Edison Co., which will own the reactor, the General Electric Co., which is the contractor for the job, Bechtel Corp., which is the engineer-constructor for General Electric, and NPG, which is furnishing a substantial part of the money necessary to make the project possible.

My principal purpose in taking advantage of your invitation to testify is to tell you of the solid progress we are making and to add my views to those of Mr. Willis Gale, president of Commonwealth Edison, and the others who have appeared in your current hearings and who have tried to shed light on the problem of insurance.

This problem is of vital importance to the atomic industry and, in my opinion, is one which needs to be faced up to immediately, rather than 2 or 3 years hence.

In this connection, I was very glad to hear that this committee plans to hold a seminar on the subject of insurance in the near future.

Chairman ANDERSON. That will be on the fifteenth now.

Mr. SPORN. Instead of the 12th?

Chairman ANDERSON. Instead of the 12th.

Mr. SPORN. Thank you.

Chairman ANDERSON. It was felt that we ought to leave a little bit of time between completion of the hearings and your panel study that is going to be taking place in New York on something like the 8th and 9th before we went on with the hearing here.

Mr. SPORN. First of all, I want to express my admiration for the McKinney report. The insight and balance which are reflected throughout the report will, I feel sure, be of great help in illuminating and clarifying many features of this subject which have heretofore been confused and obscure. The report is a tribute both to the panel and to this committee which initiated the panel study.

I hope the one point of criticism which I am going to offer about the report will not be regarded as diluting my high regard for the job the McKinney panel has done.

As you have doubtless surmised, my disagreement with the panel relates to the problem of insurance. However, before addressing myself directly to that point, I need to speak about the status of the Commonwealth Edison-NPG project in order to make clear the practical bearing of my comments on the report.

As an executive of the American Gas & Electric System and as an engineer who has been working all his professional life in a constant effort to improve the technology of electric power production, I have been studying the possibilities of nuclear power since the fall of 1945, almost immediately after the initial public disclosure about the atomic energy project.

From the beginning, my company tried to translate our interest in the subject into some form of active participation in work in this field. Up to now, our most ambitious endeavor along this line has been membership in the Nuclear Power Group, which dates back to 1953. When the group was incorporated just about a year ago, I became its president.

NPG is a nonprofit membership corporation consisting of eight members: American Gas & Electric Service Corp., Bechtel Corp., Central Illinois Light Co., Commonwealth Edison Co., Illinois Power Co., Kansas City Power & Light Co., Pacific Gas & Electric Co., and Union Electric Company of Missouri.

All of us who are associated in this work are excited about it. As you know, the principal job we are working on is the 180,000 kilowatt nuclear powerplant which is known as the Dresden plant of Commonwealth Edison Co. and which will be located about 50 miles southwest of Chicago.

Commonwealth will own the Dresden plant.

General Electric has contracted to do the job for $45 million.

Mr. Francis K. McCune of that company has already described to you how, because of GE's conviction that it was important to proceed with such a large-scale demonstration project at an early date, that company was willing to fix a contract price in the amount of $45 million, even though its own costs would exceed that figure.

Commonwealth will pay GE $30 million as its capital investment in the plant, this being approximately the amount justified by Commonwealth on a competitive power cost basis.

Nuclear Power Group will pay the remaining $15 million as a research and development contribution which will enable the project to be brought into being and which will give the members of the group the kind of experience and know-how which can only come from active participation in the design, construction, and operation of a full-scale nuclear plant.

We are proceeding with the work entirely as a privately financed undertaking without any Government contribution. We are making good progress. We confidently expect that the reactor will be in full-scale commercial operation, supplying power to Commonwealth's consumers, in 1960.

General Electric and Bechtel already have over two hundred people engaged in the design work. Extensive research is being performed on fuel. Experimental fuel fabrication facilities will be established at General Electric's San Jose installation this spring.

Prototype control rod and fuel handling facilities will be under test by summer.

Indeed, the work is so well along that General Electric expects that, by next year, it will have a pilot model of the reactor in actual operation producing steam to generate as much as 5,000 killowatts of electricity in a turbine to be supplied by Pacific Gas & Electric Co., one of the members of the NPG group.

We expect that ground-breaking at Dresden will take place sometime this summer. Originally, we had estimated that the plant would commence commercial operation about December 1960. The progress made in recent months, however, leads us now to believe that we can beat that date by nearly 6 months.

As the work has proceeded during the past year, there have been a number of encouraging developments. Originally we expected that the output of the plant would be 180,000 killowatts. More recent studies indicate the possibility that we may get a significantly better output; any increase in capacity would, of course, be an important contribution to furthering the economics of the job.

The heat performance is expected to reach a figure of 11,925 B. t. u.'s per killowatt-hour. This represents a thermal efficiency of more than 28 percent. While this efficiency is less than can be achieved by modern conventional generation, it is nevertheless a quite respectable figure.

Senator BRICKER. What is the relevant percentage in the conventional?

Mr. SPORN. The best is about 37½ percent.

Mr. BRICKER. Thank you.

Mr. SPORN. All in all, the work that has been done makes me confident that at Dresden we are going to learn a great deal about the art of generating steam by direct contact with an atomic reactor and that this knowledge will be of significant value. It will help us determine whether future boiling water reactors can be built on a basis competitive with conventional plants; it will also be of value in the investigation of other reactor concepts which need to be explored in discovering the best way to produce nuclear energy, particularly economical nuclear energy.

In order to give you an idea of the economics of what we are doing at Dresden, let me recall the testimony which Mr. Gale gave a few weeks ago.

At that time he indicated that the estimated cost of electric energy at Dresden, treating the plant as a $45 million investment, would be approximately 10 mills per kilowatt-hour. Mr. Gale said further that, because of the $15 million contribution which NPG is making, he estimated the cost to Commonwealth would be 7½ mills per kilowatt-hour, which will make the plant, on the basis of a $30 million investment, roughly competitive with conventional plants using coal as a fuel in the Chicago area and elsewhere in the United States where fuel costs of 25 to 30 cents per million B. t. u.'s prevail.

There are, of course, many places in the country where conventional fuel costs are lower than 25 to 30 cents. But you can see that, if we succeed in the Dresden job in getting the actual cost down to 10 mills per kilowatt-hour, we will be in striking distance of achieving competitive atomic power at least in some important areas of this country.

In this connection, it may be helpful to indicate the relationship between the Dresden project and the pressurized water project at Shippingport. Shippingport, which will be completed much earlier than Dresden, will certainly advance the technology of that particular line of development. It will enable us to learn the problems and the limitations which can only be discovered about the pressurized water reactor by building and operating a large-scale demonstration project. It will also add to our knowledge of the general problems of nuclear technology.

The boiling water reactor at Dresden, in my opinion, represents the next logical step in building another large-scale demonstration project. I speak of it as the next logical step because current technology gives us confidence both that it can be brought into practical operation and that it affords a reasonable expectation of advancing the industrial art still further along the road to competitive atomic power.

As compared with PWR, the Dresden plant will make possible higher pressures, higher temperatures and other features which can bring about economies in the generation of steam to propel a turbine and these savings will show up in the ultimate cost per kilowatt-hour.

Let me say, parenthetically, that NPG is already looking further ahead and is currently investigating even more advanced types of reactors.

We have a group working in cooperation with Babcock & Wilcox Co. on an intensive study of an aqueous homogeneous reactor. The complications in this design are such that a large demonstration reactor cannot be undertaken just yet. But the concept offers attractive possibilities for economies both in capital and in operating costs and we have every hope that the work we are doing now will lead to a large demonstration reactor of this type.

In short, what I have tried to convey to you is that NPG is actively at work with Commonwealth Edison and General Electric on the Dresden demonstration plant, and that the project is moving ahead at a really rapid clip and will represent a significant advance in design and economics of competitive nuclear power.

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At the same time we are already at work on the next step which envisions reactors representing a still further advance along the road.

Now I must revert to the problem of insurance.

This is the one remaining major hurdle which needs to be overcome before the Dresden project is in the clear, so that we can confidently look forward to completing it on schedule. Bear in mind that NPG and Commonwealth are now actually spending money for the Dresden plant at the rate of three-fourths of a million dollars monthly. We are going ahead with this without any Government financial assistance. This is the rate at which we must continue to spend in order to have the project in operation by the summer of 1960 as now scheduled.

The question we face is how long we are justified in continuing expenditures at this rate without assurance that the problem of insurance will be solved.

It is my present judgment that the Dresden project cannot proceed to final completion with the insurance issue up in the air. At some point, and the earlier the better, we need to know that the problem will be solved. Until that point is reached, we are going to have progressively more difficulty in justifying the heavy financial contributions which we are putting into the project and which, without insurance, could leave us at the date of operation with a plant that prudence might not permit us to operate.

There is much to the McKinney report on the subject of insurance with which I heartily agree.

We are going to make the Dresden reactor just as safe as it is humanly possible to do. We believe we will end up with a reactor that is so safe that the danger of a serious atomic accident will be too remote to cause any apprehension. But, as the McKinney report says:

> No 100 percent safe power reactor has as yet been conceived; 99.99 percent safe may not be enough.

And in the extremely remote, but nevertheless real, contingency of an atomic catastrophe, the number and amount of claims for resulting injuries and damage may reach very large proportions.

Considering the potential magnitude of the claims, the companies concerned cannot, in justice to their owners, assume liabilities so great as to threaten their solvency. Moreover, we believe there is a responsibility, not only as a matter of prudence, but also morally, to make sure that anyone who has a just claim for personal or property damage will have a place to go for the satisfaction of his claim.

In what I have been saying, I have been speaking, of course, not of ordinary insurance which is available to take care of the usual hazards in industrial operations. I am speaking only of insurance or indemnification to cover third party liability resulting from a major atomic catastrophe, an event that almost certainly will never occur but which, should it occur, could involve injury to persons and property in amounts so large that we cannot, in the context of our brief experience, set their outside limits.

The insurance companies of the country, both stock and mutual, will have done an outstanding job if they are successful in offering the atomic industry coverage for third party liability up to the 50 or 60 million dollar figures which have been mentioned.

In their effort to meet the problem, they have gone further than they have ever gone before in connection with third party liability. Unfortunately, the fact that our experience to date with reactors is so meager makes it impossible for anyone to demonstrate that even this unprecedented sum would be adequate.

My point of disagreement with the McKinney panel is the suggestion in the report that:

> At least 2 and possibly 3 years remain in which to conduct research and accumulate knowledge and experience before any substantial private activity can be delayed or stopped because of inability to obtain adequate insurance.

In this conclusion, and despite my great respect for the panel, they have misgaged the situation. I believe the fact to be, and testimony before your committee supports that belief, that, within a very short time, nearly all non-Federal activities will be badly delayed, and some even stopped completely, unless the third party liability problem is faced immediately.

Moreover, research and investigations during the next 2 or 3 years are not going to provide the answer to whether or not the 50 or 60 million dollars which may be offered by the insurance companies would be adequate or whether the possibility of a major atomic accident is so remote that it can be disregarded altogether. Only experience in the actual operation of a variety of reactors will give answers to these questions.

And here we face a dilemma. We shall get that necessary experience, the factor on which all insurance is based, only by completing and operating reactors for a considerable period of years. But the atomic industry cannot complete and operate reactors without some form of assurance that the potentially very great claims resulting from a major catastrophe could be satisfied.

The McKinney report suggests that if private interests are deterred from proceeding with reactors because of this circumstance, the Government should proceed to build and operate them. But this proposal is not a way of avoiding the insurance problem; if the Government builds the plants it must face the problem of liability in the event of an atomic catastrophe just as squarely as we must face it and, in addition, must pay the full cost of the plants.

A refusal to face up to this liability problem does not seem to me to be consistent with the purpose of the Atomic Energy Act to encourage the growth of a non-Federal atomic industry, a growth which, I believe, will be largely or wholly checked by the failure to provide an adequate solution of the problem.

We are all agreed, I think, that it is in the interest of the public at large to get ahead as rapidly as feasible with building atomic powerplants and putting atomic energy to peaceful uses. The risk of a major atomic accident is remote, but, should it ever materialize, it could be so large that there is no agency except the Government of the United States now capable of assuming the risk; in other words, the people of the United States as a whole.

It seems to me that, at least for an interim period during which actual experience in the operation of reactors is being obtained, this is a risk which the people of the United States as a whole, through the Government, should commit themselves to cover.

The people will certainly be deceived if they are led to believe that the risk can somehow be avoided by having the Government build all the reactors. Our purpose should, instead, be to devise measures that will permit the atomic industry to go forward with its plants in accordance with the policy of the present law to promote the growth of such an industry.

Specifically, therefore, I urge this committee to consider fully, at the earliest possible date, legislation to fill the gap which now exists and to remove the last major hurdle to completion of projects like that at Dresden which, in all other respects, is moving along so impressively.

The necessary legislation could take the form of excess coverage over that offered by the insurance industry, indemnification, or any other arrangement which would achieve the same end result. But these are technical matters about which others are better qualified than I to advise the committee.

Judging from their past performance, I am satisfied that the insurance industry itself will be of great assistance in resolving issues of this kind and in helping the committee to formulate legislation which will conform to the principle that, in all ordinary affairs where experience is available, we should look to the insurance industry for coverage.

I believe, too, that the insurance industry will be of assistance in formulating a program which minimizes administrative complications and which takes advantage of the vast experience of that industry in dealing with claims.

Those of us who are engaged in atomic work are, of course, willing to pay for any coverage which the Government provides over and above the third-party liability which the insurance companies can offer on a reasonable basis. However, when the question of a charge for the extraordinary third-party liability coverage is considered, I need to emphasize, as other witnesses have done, the relationship of that cost to the feasability of our project.

My purpose, as I indicated at the beginning, is to urge very strongly the necessity of legislation in some form, just as soon as possible, so that the last remaining major barrier will be eliminated to permit us to go forward and complete our project, a project which, we strongly feel, will represent an important step forward along the road to the practical and economical production of nuclear power.

Chairman ANDERSON. Mr. Sporn, on page 4 of your statement, the first paragraph starts there:

> We are proceeding with the work entirely as a privately financed undertaking without any Government contribution.

It was pointed out this morning, the question of the Detroit Electric Co., that they were going to charge a good deal of this to research and not add it to the customer's bill but take it out of profits.

Would not the Government contribute 52 percent under those circumstances?

Mr. SPORN. Well, Senator, I wonder if I could answer that specifically with respect to my own company.

Chairman ANDERSON. Well, do you not pay a corporate tax?

Mr. SPORN. Yes; we do, Senator.

Chairman ANDERSON. On profits?

Mr. SPORN. Yes, sir.

Chairman ANDERSON. If profits were not reduced, would not the Government thereby be taking 52 percent?

Mr. SPORN. I believe that is right. I believe this:

We are going to charge our research, Senator, which amounts to about $600,000 this year, to operating expenses.

Chairman ANDERSON. Will that not reduce your profits?

Mr. SPORN. This will reduce our profit by roughly $300,000.

Chairman ANDERSON. You mean profit after taxes or before taxes?

Mr. SPORN. After taxes.

Chairman ANDERSON. That is right. But before taxes you are reduced $600,000. I pay taxes, too, Mr. Sporn, although not as large as you do, but I know you pay income taxes on corporate profits.

Mr. SPORN. Yes, sir.

Chairman ANDERSON. If it reduces your profits $600,000, does the Government thereby not contribute 52 percent to the cost of this research, or are you in a different situation?

Mr. SPORN. To the extent that you subject yourself to additional operating expenses and therefore reduce your taxes by 50 percent of those expenses, that represents a Government contribution here, but that is true of everything that corporate enterprise does.

Chairman ANDERSON. Surely.

Senator BRICKER. That is on the basis that there is no benefit coming from those profits to the community.

Mr. SPORN. That is the immediate initial effect. It certainly does not cover the effect of looking at it over a period of time.

Chairman ANDERSON. In the Shippingport project, they began with a quick writeoff. Did that not have something to do with the amount of tax they were paying?

Mr. SPORN. I think that a quick writeoff, Senator, affects taxes for a period of 5 years but in the NPG project, incidentally, I might state that we have no accelerated amortization in mind at the present time. So far as I know, no application for any fast writeoff has been made on our project.

Chairman ANDERSON. Let me move to another one.

Farther along on that page you say:

> Indeed, the work is so well along that General Electric expects that by next year it will have a pilot model of the reactor in actual operation producing steam to generate as much as 5,000 kilowatts of electricity in a turbine to be supplied by Pacific Gas & Electric Co., one of the members of the NPG group.

Is that the announcement made here about a week ago about the General Electric and Pacific Gas & Electric going to build a reactor?

Mr. SPORN. I think it is the same one.

Chairman ANDERSON. Is it a pilot model of what will finally be developed?

Mr. SPORN. Yes, sir.

Chairman ANDERSON. It will involve some of the same principles?

Mr. SPORN. It will involve some of the same principles and test some of the design phases.

Chairman ANDERSON. I asked Chairman Strauss about that and on page 77 of the hearings he said:

> The General Electric Co. and Pacific Gas & Electric Co. notified us of their decision to build and operate an atomic powerplant to serve the San Francisco Bay area.

Was it your understanding that this atomic powerplant was built to serve the San Francisco Bay area or is it a pilot plant?

Mr. SPORN. My understanding is that it is being built as a pilot plant and that the output of the plant will go in the San Francisco Bay area.

Chairman ANDERSON. Yes. Five thousand kilowatts is how much of a contribution for the San Francisco Bay area?

Mr. SPORN. It is a small amount.

Chairman ANDERSON. A drop in the bucket?

Mr. SPORN. You could call it that; yes sir. But it will be the first commercial boiling-water reactor and that will be the interesting thing.

Chairman ANDERSON. Then Admiral Strauss said:

> The plans call for completion of the plant during 1957 at a cost of between 3 and 4 million dollars. The plant is the fourth reactor proposed by industry under the straight licensing provisions of the law whereby such plants are financed entirely by private funds without request for direct Government financial aid.

Would you regard this as a fourth reactor, if it is a pilot plant for the fourth reactor?

Mr. SPORN. We are getting into a question of semantics.

Chairman ANDERSON. I do not think so.

Mr. SPORN. It is an additional reactor I believe that.

Chairman ANDERSON. We were trying to find out how rapidly the program was going forward and the chairman of the Atomic Energy Commission cited this as an example of a fourth type of reactor being built by industry.

Mr. SPORN. I think it is an additional reactor, sir.

Chairman ANDERSON. It is an additional reactor?

Mr. SPORN. Yes, sir.

Chairman ANDERSON. But it is a pilot plant. Therefore, if you are going to have 12 now and you build a pilot plant for each one, that becomes 24; is that right?

Mr. SPORN. I would say in a sense, Senator, all plants that are being built today are pilot plants.

As you know, not a single one of the plants that are in process of construction are going to be commercial plants in this sense, that they will generate power as economically as conventional methods can produce power today.

So in one sense they are a part of a developmental-experimental program designed to push along the objective that we are all aiming at, which is the production of economical atomic power.

Chairman ANDERSON. I do not question the wisdom of that at all. We were trying to find out how rapidly this program is coming along and we were told that there was a certain number of plants, and the expression was that they were underway. When I tried to find out how far underway they were, this plant is an example of one plant that was underway.

Mr. SPORN. If I may say so, Senator, as one who has had a great deal of experience in putting together, projecting, designing, and building powerplants, that that is an achievement of no mean order, to get a job like that going in a little over a year. I think that is a fine contribution to the atomic program; whether fourth or not I just do not know, but I do know it represents an additional plant, Senator,

that we did not know anything about and did not know we were going to be able to get, say, a month ago.

Chairman ANDERSON. I hope you will read that testimony sometime because Mr. Cole asked if this would be used by the Livermore Laboratory, and the answer was that to the extent it would be in the grid, I would imagine so.

I thought it was a small pilot plant. I still think it is a small pilot plant.

The Shippingport reactor which you mentioned earlier, has there been an estimate of what electricity will cost generated there?

Mr. SPORN. I have seen an estimate prepared, I think last December, by Admiral Rickover, which he sent me and he presented figures there in a series of three cycles: The initial costs, later costs, with a larger core, and still later costs that would come along following that over a period of 7 or 8 years. They started in rather high.

Chairman ANDERSON. Fifty-two mills?

Mr. SPORN. It started in at 52 and ended up, as I recall, at 14, Senator.

Chairman ANDERSON. Now, on page 8 you have the following:

> It is my present judgment that the Dresden project cannot proceed to final completion with the insurance issue up in the air.

Mr. Gale was of that opinion also?

Mr. SPORN. I read his testimony. Yes, sir; that is what he said.

Chairman ANDERSON. So that if the Congress should by some chance fail to do anything with the insurance problem, you feel that that project might be very substantially delayed?

Mr. SPORN. I would think that it would put quite a crimp into it, Senator.

Chairman ANDERSON. I believe you stated here in one place that it might slow up a great many of these plants. You said:

> A refusal to face up to this liability problem does not seem to me to be consistent with the purpose of the Atomic Energy Act to encourage the growth of a non-Federal atomic industry—a growth which, I believe, will be largely or wholly checked by the failure to provide an adequate solution of the problem.

You do think, then, that the development of a non-Federal atomic industry would be largely or wholly checked if there is not an adequate solution to this insurance problem?

Mr. SPORN. It would certainly be materially checked, maybe completely checked.

Chairman ANDERSON. I believe on the previous page you said:

> I believe the fact to be—and testtimony before your committee supports that belief—that, within a very short time, nearly all non-Federal activities will be badly delayed, and some even stopped completely, unless the third-party liability problem is faced immediately.

Then we take it that some of these plants that are on the way might be delayed or even stopped if there is not a solution to this liability problem?

Mr. SPORN. It could be. I would think if people gave up hope of solving the problem, they might stop them completely.

Chairman ANDERSON. The hope of solving it is passing it on to the Government, is it not?

Mr. SPORN. That is right.

I believe, as I pointed out, Senator, that this is a question that is uniquely soluble, can be resolved, only by the people of the United States. I think there is no doubt in my mind——

Chairman ANDERSON. You do not propose that they solve it as individuals. You propose that they solve it by the Government——

Mr. SPORN. The people through the Government.

Chairman ANDERSON. Becoming the excess reinsurer?

Mr. SPORN. That is right.

Chairman ANDERSON. You propose that the insurance that is available from both stock and mutual companies, and I do not quite understand the $50 million limitation because I understood the stock companies felt they could come up with $50 million, and probably the mutual companies could make some contribution, but say that that is the limit and the liability ran up to $1 billion and the Government would pick up all reinsurance above $50 million, is that correct?

Mr. SPORN. That is my idea; yes, sir.

Chairman ANDERSON. Would your idea be that there would be any payment for that?

Mr. SPORN. Indeed, it is so. I would expect that there would be some fair kind of compensation.

Chairman ANDERSON. It would not be a Government contribution then?

Mr. SPORN. No.

Chairman ANDERSON. I do not quarrel with your conclusion at all. I have been trying to say for some time that I thought it was important that we do something with this insurance problem, which I thought eventually would slow up the program.

Representative PRICE. I agree with the position you have just taken. We all recognize the fact that the insured one must do the job before we can go all out on this program.

Chairman ANDERSON. Mr. Sporn, you come to us as a good witness because you took on the responsibility of the Ohio Valley Electric Co. to build a plant for the use of the Atomic Energy Commission, a specific plant for a specific purpose. You finished it either on schedule or ahead of schedule?

Mr. SPORN. Ahead of schedule, Mr. Chairman.

Chairman ANDERSON. It is producing as much or more than it was expected to do?

Mr. SPORN. That is right.

Chairman ANDERSON. And, therefore, your testimony is very important to me as I think it is to other members of this committee. It is good testimony and I am inclined to listen to it because I think you speak authoritatively and you speak on the basis of what you have done, not only as an operator in your own business but what you did under that specific task in the development of a powerplant and got it underway in a reasonable time.

I think your testimony is of value to us and I appreciate your being here today.

Mr. SPORN. Thank you.

Senator BRICKER. It was very encouraging as I listened to Mr. Sporn in his presentation of his position. I think the whole committee was cognizant of the problem in regard to insurance. We are also anxious to determine how long it will take before there is an actuarial

experience for the private companies taking over the program of insurance.

I think I agree with you that in the interim it is necessary for the Government, if private industry is to move into this field, to assume a part of this responsibility. Just how it will be worked out, I do not know. We have no actuarial background on which to determine. It is more or less a guess, estimate, of what might happen.

We hope that there will never be any occasion for it, as there was not for war insurance during the war. It is a problem that we have been conscious of, and I think every member of this committee wants to arrive at a solution so there will be no delay in the private development field.

We asked everybody that we could get in touch with at Geneva about the 1954 law.

I take it from your testimony that this is the most important aspect that needs to be given attention. Is there any oher amendment that you would suggest that ought to be considered?

Mr. SPORN. At this time, Senator, this is the only one that really bothers me.

Senator BRICKER. Do you think that private industry can move along very well?

Mr. SPORN. I think private industry is moving along beautifully, and I think it will continue to move along. We certainly need to remove this very major barrier.

Senator BRICKER. And you feel the insurance companies are willing and ready to assume the proportion of the obligation that they can, with the Government guaranty of any overage?

Mr. SPORN. I think, on the whole, the insurance companies are meeting their responsibilities but they are faced here with a very terrific problem in which they have no experience, and that is the essential element in insurance and we have to get some experience, but we cannot get the experience unless we get some reactors operating.

Senator BRICKER. The problem is not only important to the insurance companies from the financial point of view, it is of vital importance to the public in the other fields in which they are insuring as well as this one?

Mr. SPORN. That is right.

Senator BRICKER. If there should be a collapse of an insurance company or several companies?

Mr. SPORN. Let me point out to you an observation I tried to make in my direct statement.

It seems to me it is a responsibility that this committee, I know, recognizes that we have this question not only of how much property might be destroyed and the wiping out of the assets of corporations that might run into a billion dollars, but the property harm, damage to people, and the moral responsibility of seeing that whatever just and legitimate claims they have, they can come and present to a responsible agency.

Unless we provide for that, we are certainly setting up an atomic program which, if it does go along on some kind of basis, will be based upon potential or contingent damage to a great many people, and that I do not think the people of the United States want.

Senator BRICKER. Far beyond the immediate injury that comes from the atomic damage that might result.

Have you given any thought to what a reasonable rate for such insurance would be?

Mr. SPORN. Senator, I have not and it becomes quite a technical matter, but it is certainly a problem in which we will be very happy to join with the insurance companies in working out something to the extent that they can go.

Once the Government decides to go ahead and provide the excess insurance, if we can be of any help, of course we will want to help and give our ideas, if we are permitted to or asked to.

Senator BRICKER. Thank you very much.

Senator JACKSON. Mr. Chairman?

Chairman ANDERSON. Senator Jackson.

Senator JACKSON. I want to say, Mr. Sporn, that I think you have given us a clear and concise picture of the need for Federal insurance in this field. I think your statement at least makes it clear to me that if we are going to encourage private industry to build new reactors and to participate in this program, the Federal Government at least will have to assume that part of the insurance risk that cannot be borne by insurance companies or the insured companies.

I want to compliment you for presenting to the committee a clear and concise statement of this specific problem. Congressman Price, I believe, has already introduced an amendment, if I am not mistaken—he is chairman of the reactor subcommittee—and I think his bill, in effect, would cover the problem that you have presented to the committee. I do not know the precise language but such legislation has already been introduced, I believe, in the form of an amendment.

Mr. SPORN. I have read of it, Senator, and I am delighted to see such quick action but I have not had an opportunity to read the bill.

Senator JACKSON. I have another meeting that I have to go to, Mr. Chairman.

Thank you very much.

Chairman ANDERSON. Thank you very much, Mr. Sporn.

Mr. SPORN. I want to thank the committee, Mr. Chairman, for giving me the chance to appear before it.

Chairman ANDERSON. We hope that you will continue to come and appear any time we have a hearing. You always have something to offer.

Mr. SPORN. Thank you very much.

Chairman ANDERSON. Mr. Lindseth?

Please state your name and the capacity in which you appear.

STATEMENT OF ELMER L. LINDSETH, REPRESENTING THE EDISON ELECTRIC INSTITUTE, PRESIDENT OF THE CLEVELAND ELECTRIC ILLUMINATING CO.

Mr. LINDSETH. My name is Elmer L. Lindseth. I am president of the Cleveland Electric Illuminating Co., a member of the Edison Electric Institute Committee on Atomic Power, and a past president of the institute.

I am appearing today on behalf of the institute in response to a letter addressed by the Honorable Senator Clinton P. Anderson, chairman of the Joint Committee, to the president of the Edison Electric Institute.

Your invitation for a representative of the institute to appear before you again is very much appreciated, in view of the vital interest which the institute, as a body, and its member companies have in these matters.

The member companies of the Edison Electric Institute serve 93 percent of the electric customers receiving service from the investor-owned electric utility industry, which, in turn, serves approximately 80 percent of the total number of electric customers in the United States, so the institute represents suppliers to 75 percent of all users in the industry.

Chairman Anderson's letter was referred to the Committee on Atomic Power of the Edison Electric Institute, which comprises 13 member company executives, and this statement has been authorized by that committee. The names and business affiliations of the members of the committee are appended to this statement.

Exploring and improving the use of nuclear energy as a power source has become an integral part of the everyday activities of our industry in seeking to lower the cost of power for the continuing benefit of the public. Our industry has a long record of reducing the cost to the public of its service through development of new methods and processes and improved efficiency of operations. We seek every possible means of continuing this long-term trend for the benefit of our customers.

A fundamental belief of the members of the institute's committee on atomic power is that in order that America may derive maximum benefit from the commercial application of atomic power to electricity production, the development of this important energy source must have the active support and leadership of competitive enterprise.

Our entire approach to the challenge and opportunities offered through atomic energy is based upon this fundamental belief.

That our industry has an objective interest in the utilization of atomic energy is indicated in part by the fact that each year since 1953, the investor-owned electric utility companies, as represented by the Edison Electric Institute, have submitted to the Joint Committee either testimony, specific recommendations or statements of views, all looking to means for encouraging wider industrial participation in the development of the peaceful atom.

Representations also have been made to the Joint Committee by a number of the leaders of our industry, these, of course, dealing with more specific situations. Important as such presentations may have been, they represent a relatively small part of our industry's overall contribution in this field.

Although the revisions in the Atomic Energy Act permitting industry participation in the atomic energy program fell short of our previous recommendations to the Joint Committee, nevertheless, today, just 20 months after passage of the 1954 act, more than 300 million free-enterprise dollars are involved in the planning and construction of atomic electric powerplants and attendant research.

The Duquesne Light Co. is participating with the Atomic Energy Commission in the construction of a commercial atomic powerplant. Plans have been announced for the building of seven additional large, medium, and small-size reactor plants by investor-owned companies based on reactor designs thus far developed by the Atomic Energy

Commission. The announcement of the sixth and seventh plants has just been made.

Still another company, the Southern California Edison Co., is participating with the Atomic Energy Commission in building electric generating facilities for a ninth atomic powerplant. As other promising reactor designs are developed, it is expected that our industry again will be ready to take major responsibility for their commercial development with private capital.

Chairman ANDERSON. You said announcement of the sixth and seventh plants had been made; what happened to the eighth and ninth?

Mr. LINDSETH. Calling Duquesne No. 1, there would then be seven additional and eighth and ninth with Florida and the P. G. & E. 5,000-kilowatt reactor.

Chairman ANDERSON. You regard that as a separate plant?

Mr. LINDSETH. Yes, I do. I share Mr. Sporn's view that that is a separate plant.

Chairman ANDERSON. I thought he thought it was a pilot plant.

Mr. LINDSETH. Well, I would refer to his word "semantics." I think, too, I would share his view that in effect all of these are pilot plants and for this reason, namely, that none of them is a commercially feasible plant in the sense that any of the plants will generate power at a cost competitive with today's fuel technology. So, as a consequence, each of them in effect is one of the first generation, that is, a pilot plant, leading to experience which we hope in the second or subsequent generations will enable us to generate competitively.

Chairman ANDERSON. I am just wondering how many small pilot plants were built before the reactor was put in the *Nautilus*.

Mr. LINDSETH. I think two.

Chairman ANDERSON. Then did we build 3 plants when we built the *Nautilus* plant or 2 pilot plants and a powerplant?

Mr. LINDSETH. I suppose they were prototypes of the plant that went into the *Nautilus*. I think, at least from the reports in the public press, the land-based prototype at Arco is essentially the powerplant that went into the *Nautilus*.

Chairman ANDERSON. That is what I thought. The American people have some interest in these and if you keep listing over and over again you can quickly get up to 30 plants.

Mr. LINDSETH. It might be unfortunate that the term "pilot plant" was used in connection with the California plant.

Chairman ANDERSON. You do not think it is a pilot plant.

Mr. LINDSETH. I think in the sense that you are using it, it is a pilot plant.

Chairman ANDERSON. Then why was it?

Mr. LINDSETH. I use the word in view of the fact that there is great need in the industry, the entire atomic power generation industry, for experience in small-sized plants of the five, ten, and twenty thousand size for which this might be one of the very important experimental and developmental milestones.

Chairman ANDERSON. I am only trying to keep from misleading the American public from thinking that we have a dozen plants underway when we have maybe 2 or 3 pilot plants and hope that as we go along we will have 4 or 5 more.

I am trying to keep the public from being fooled. Here is Mr. Sporn saying that if we do not solve the insurance problem some of these big plants may not get built. In the meantime, Britain has finished Calder Hall and are about to finish the second and are starting on a whole series of 100-kilowatt plants.

Russia announces a whole program of plants. Would you not think it unfortunate if the insurance problem failed to get solved, and sometimes they do fail to get solved, and there we stood without a single plant under construction for a considerable period?

Mr. LINDSETH. That would be very unfortunate and unwise.

Senator BRICKER. Mr. Chairman, I suggest that there is this distinction:

This plant is producing utilizable power and the prototypes of the *Nautilus* powerplant were not for the purpose of propelling ships but only to test the efficiency of the ultimate plants. This may have both purposes. It does produce a small amount of electricity, true, but there is some utilizable byproduct of the research that will come to the plant.

Chairman ANDERSON. I remember a bit of doggerel which I associate with a naturalist and it went something to the effect that you have this tiny flea and on the tiny flea there are other tiny fleas and it went on ad infinitum.

This powerplant had a pilot plant ahead of it; did it not?

Did not the Atomic Energy Commission build a smaller one?

Mr. LINDSETH. I think we have several.

Chairman ANDERSON. We have to keep on going down to decide how many plants we have altogether. I was just hopeful that we might not regard it as a plant until it got up to sufficient size so that the American people would not be fooled into thinking that the program was going on if it actually did not get underway.

I am interested in a plant of substantial size and I am going to be interested in knowing how many more plants of substantial size, because I think this country, which has had a wonderful experience in mechanical things, should not fall behind other nations. That is the only interest I have.

Senator BRICKER. This specific gas and electric plant is only costing $1.5 million as contrasted with $50 million for the Florida group and $33 million for Yankee and $53 million for Consolidated Edison and $15 million for Duquesne. That is the amount of private money.

Chairman ANDERSON. I fully think that it is important that this pilot plant be built and I think it is too bad that Russia got a 5,000-kilowatt plant going and claimed it was the pioneer in the field. I think this country might have said that this Arco plant delivered a certain amount of power and therefore it was in the field along with the Russians.

I get tired of hearing the Russians say that they are ahead of us. I hope we will have plants comparable to what they have.

Go ahead, I am sorry to have interrupted you.

Mr. LINDSETH. A total of 44 investor-owned companies are singly or in groups participating in building these reactor plants.

I would like to direct your attention to the appendixes. On the first of the appendixes attached, there are listed at the top these several reactor plants—9 of them in all—to which I have referred,

and for which the utility industry is assuming development and design responsibility for the reactors in 7 of them.

The Atomic Energy Commission, is, in connection with Duquesne Light Co. and Westinghouse, as a contractor assuming responsibility for the reactor in the first. In the ninth at the bottom to which you referred, North American Aviation installing the sodium graphite reactor is providing the reactor technology and Southern California Edison the generating facilities.

The significant figures, which are larger than the 800,000 mentioned in the hearings this morning, are that the aggregate electric output of these plants is in excess of 1,100,000 kilowatts.

Exclusive of the two for which the Atomic Energy Commission is providing the reactor sponsorship, namely, Duquesne and Southern California, electric utility companies singly and in groups for the projects between the two dotted lines are providing reactor construction and technology for over 1 million kilowatts. That figure is some 200,000 larger than the 800,000 mentioned this morning by the addition of the Florida group just announced within the past week and the P. G. & E. 5,000 unit we described.

Chairman ANDERSON. May I ask you again, how far along is this Florida group? Have they decided what type of reactor they are going to build?

Mr. LINDSETH. I think not. Whether they have decided is a matter I do not know, but they have announced at least the intention to build and, as I understand it, are in negotiations with two contractors, builders, for development of design and selection of type and the like.

Chairman ANDERSON. Would you think that the capacity should be added to this list until they have reached the decision as to what they were going to try to build? They merely announced they were going to do something in the future if something developed.

Do you think that is firm enough to put in the list to show that there is 1 million kilowatts?

Mr. LINDSETH. There again we get into the matter of degree. I think it is for the purpose of my presentation to show the widespread interest on the part of our industry in reactors in widely varying geographical areas.

Florida is a high-fuel-cost areao it is far removed geographically from New England and the Pacific coast and it illustrates interest on the part of a group of utilities heretofore not prominently identified with atomic power. These are those companies which have indicated an intention to proceed with the engineering studies, the development, design, and installation of nuclear plants.

The dollars in the next column indicate the scale of the endeavor, some $300 million will be required for the investment by the investor-owned utility companies in furtherance of their portions of these aggregate programs. Those are, both of them, I submit, very substantial figures.

Chairman ANDERSON. Yes.

Now, you have in the Florida group an investment of $50 million by the Florida Power Corp., Florida Power & Light Co., and Tampa Electric Co.

What is their present capitalization?

Mr. LINDSETH. Well, I would—and I am speaking just from general knowledge—my judgement would be that they would have an ag-

gregate plant account among the three of them of about $700 million, and possibly $500 million capitalization.

Chairman ANDERSON. $500 million capitalization?

Mr. LINDSETH. Probably four to five hundred.

Chairman ANDERSON. And the Penn Power & Light Co., is their project very far along?

Mr. LINDSETH. Well, I cannot speak from technical knowledge. The project was announced some little time ago for 1962 completion and possibly you have had a witness from the company or are going to have one who could be more specific.

I think it is in the intensive study stage, engineering design.

Chairman ANDERSON. Based upon some work going on at Oak Ridge?

Mr. LINDSETH. Oak Ridge.

Chairman ANDERSON. By the Government?

Mr. LINDSETH. By the Government.

I would like to request, if I may, that this table be inserted in the record if it can be, in order that it may round out the testimony which I have presented here.

Chairman ANDERSON. I believe it will be all right. We might have some difficulty with the map.

Without objection, we will insert the table.

You want the list?

Mr. LINDSETH. Yes.

Chairman ANDERSON. They will go in.

(The information referred to follows:)

EXHIBIT I

Nuclear powerplants—Investor-owned utilities participation

Organization	Reactor type	Capacity kilowatt	Estimated investment by organization (millions)	In operation by
Duquesne Light Co.	Pressurized water	[1] 100,000	15	1957.
Consolidated Edison Co.	do	[2] 236,000	55	1959 or 1960.
Nuclear Power Group (7 utility companies)	Boiling water	180,000	45	1960.
Penn Power & Light Co.	Homogeneous	[3] 150,000	([4])	1962.
Power Reactor Development Corp. (18 utility companies).	Fast breeder	100,000	55	1960.
Yankee Atomic Electric Co. (12 utility companies).	Pressurized water	134,000	33.4	1959 or 1960.
Florida group (3 utility companies)	Not stated	[5] 200,000	[5] 50	([4])
Pacific Gas & Electric Co.	Boiling water	5,000	[5] 1.5	1957.
Southern California Edison Co.	Sodium graphite	[5] 7,500	1	1956.
Total		1,112,500	[6] 305.2	

[1] 60,000 kilowatts initially.
[2] Oil-fired superheater to contribute 96,000 kilowatts of the 236,000 kilowatts.
[3] Minimum.
[4] Not stated.
[5] Preliminary estimate as reported.
[6] Included in this figure are an estimate for the Penn Power & Light Co. plant based on an average cost and 11.8 million research costs by Atomic Power Development Associates, Inc.

Nuclear Power Group:
American Gas & Electric Service Corp.
Commonwealth Edison Co.
Central Illinois Light Co.
Illinois Power Co.
Kansas City Power & Light Co.

Nuclear Power Group—Con.
Pacific Gas & Electric Co.
Union Electric Company of Missouri
Yankee Atomic Electric Co.:
Boston Edison Co.
Cambridge Electric Light Co.
Central Maine Power Co.
Central Vermont Public Service Corp.
Connecticut Light & Power Co.
Connecticut Power Co.
Hartford Electric Light Co.
Montaup Electric Co.
New Bedford Gas & Edison Light Co.
New England Power Co.
Public Service Company of New Hampshire
Western Massachusetts Electric Co.
Power Reactor Development Corp.:
Alabama Power Co.
Central Hudson Gas & Electric Corp.
Cincinnati Gas & Electric Co.
Columbus & Southern Ohio Electric Co.
Consumers Power Co.
Delaware Power & Light Co.
Detroit Edison Co.
Georgia Power Co.
Gulf Power Co.
Iowa-Illinois Gas & Electric Co.
Long Island Lighting Co.
Mississippi Power Co.
Philadelphia Electric Co.
Potomac Electric Power Co.
Rochester Gas & Electric Corp.
Southern Co.
Toledo Edison Co.
Wisconsin Electric Power Co.
Florida group:
Florida Power Corp.
Florida Power & Light Co.
Tampa Electric Co.

EXHIBIT II

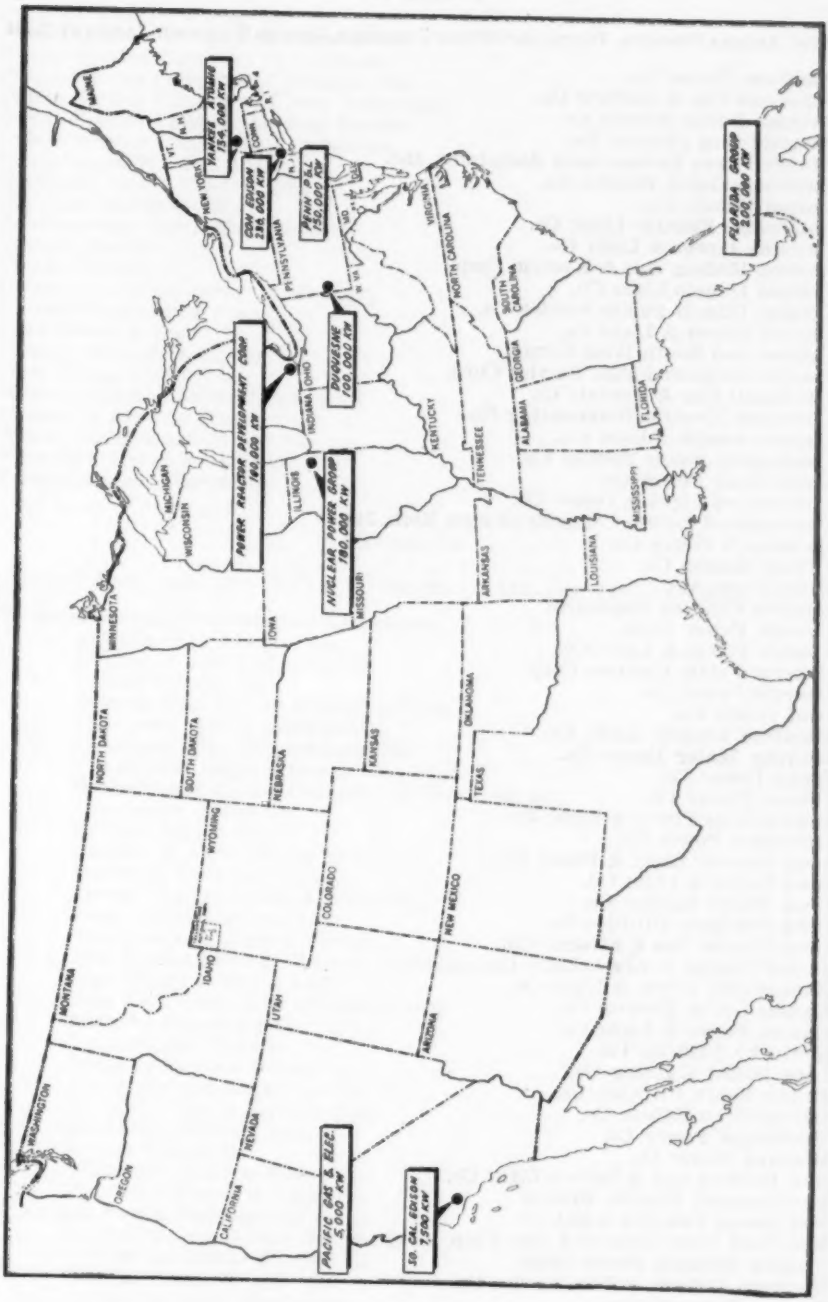
YANKEE ATOMIC
134,000 KW
CON EDISON
236,000 KW
PENN P&L
150,000 KW
DUQUESNE
100,000 KW
PWRR REACTOR DEVELOPMENT CORP
100,000 KW
NUCLEAR POWER GROUP
100,000 KW
FLORIDA GROUP
128,000 KW
PACIFIC GAS & ELEC.
5,000 KW
SO. CAL EDISON
2,700 KW
MAINE
VERMONT
NEW YORK
CONN.
MASS.
R.I.
PENNSYLVANIA
N. J.
MD.
DEL.
VIRGINIA
NORTH CAROLINA
SOUTH CAROLINA
GEORGIA
FLORIDA
ALABAMA
MISSISSIPPI
LOUISIANA
TENNESSEE
KENTUCKY
OHIO
INDIANA
ILLINOIS
MICHIGAN
WISCONSIN
MINNESOTA
IOWA
MISSOURI
ARKANSAS
OKLAHOMA
TEXAS
KANSAS
NEBRASKA
NORTH DAKOTA
SOUTH DAKOTA
WYOMING
COLORADO
NEW MEXICO
ARIZONA
UTAH
NEVADA
IDAHO
MONTANA
WASHINGTON
OREGON
CALIFORNIA

EXHIBIT III

AEC ACCESS PERMITS, INVESTOR-OWNED UTILITIES, ISSUED THROUGH JANUARY 1956

Alabama Power Co.
American Gas & Electric Co.
Arizona Public Service Co.
Atlantic City Electric Co.
Atomic Power Development Associates, Inc.
Baltimore Gas & Electric Co.
Boston Edison Co.
Cambridge Electric Light Co.
Carolina Power & Light Co.
Central Hudson Gas & Electric Corp.
Central Illinois Light Co.
Central Illinois Public Service Co.
Central Power & Light Co.
Central and South West Corp.
Central Vermont Public Service Corp.
Cincinnati Gas & Electric Co.
Cleveland Electric Illuminating Co.
Commonwealth Edison Co.
Community Public Service Co.
Connecticut Power Co.
Connecticut Light & Power Co.
Consolidated Edison Company of New York, Inc.
Consumers Power Co.
Detroit Edison Co.
Duke Power Co.
Eastern Utilities Associates
Florida Power Corp.
Florida Power & Light Co.
General Public Utilities Corp.
Georgia Power Co.
Gulf Power Co.
Hartford Electric Light Co.
Holyoke Water Power Co.
Idaho Power Co.
Illinois Power Co.
Indianapolis Power & Light Co.
Interstate Power Co.
Iowa Electric Light & Power Co.
Iowa Power & Light Co.
Iowa Public Service Co.
Iowa Southern Utilities Co.
Iowa-Illinois Gas & Electric Co.
Jersey Central Power & Light Co.
Kansas City Power & Light Co.
Kansas Gas & Electric Co.
Kansas Power & Light Co.
Kentucky Utilities Co.
Long Island Lighting Co.
Middle South Utilities, Inc.
Metropolitan Edison Co.
Mississippi Power Co.
Montana Power Co.
New Bedford Gas & Edison Light Co.
New England Electric System
New Jersey Power & Light Co.
New York State Electric & Gas Corp.
Niagara Mohawk Power Corp.
Northern Indiana Public Service Co.
Nuclear Power Group
Otter Tail Power Co.
Pacific Gas & Electric Co.
Pennsylvania Electric Co.
Pennsylvania Power & Light Co.

Philadelphia Electric Co.
Potomac Electric Power Co.
Power Reactor Development Associates
Public Service Company of Colorado
Public Service Company of Indiana, Inc.
Public Service Company of New Hampshire
Public Service Company of New Mexico
Public Service Company of Oklahoma
Puget Sound Power & Light Co.
Rochester Gas & Electric Corp.
Southern Services, Inc.
Southwestern Gas & Electric Co.
Tampa Electric Co.
Toledo Edison Co.
Union Electric Company of Missouri
United Illuminating Co.
Utah Power & Light Co.
Virginia Electric & Power Co.
West Texas Utilities Co.
Western Massachusetts Electric Co.
Wisconsin Electric Power Co.
Wisconsin-Michigan Power Co.
Wisconsin Power & Light Co.
Yankee Atomic Electric Co.

EXHIBIT IV

STUDY, RESEARCH, AND PLANNING GROUPS OF ELECTRIC UTILITY COMPANIES

1. Atomic Power Development Associates:
   - Atlantic City Electric Co.
   - Baltimore Gas & Electric Co.
   - Boston Edison Co.
   - Central Hudson Gas & Electric Corp.
   - Cincinnati Gas & Electric Co.
   - Cleveland Elec. Illuminating Co.
   - Connecticut Light & Power Co.
   - Consolidated Edison Company of New York, Inc.
   - Consumers Power Co.
   - Detroit Edison Co.
   - General Public Utilities Corp.
   - Hartford Electric Light Co.
   - Jersey Central Power & Light Co.
   - Long Island Lighting Co.
   - New England Electric System
   - New England Gas & Electric Association
   - New Jersey Power & Light Co.
   - New York State Electric & Gas Corp.
   - Niagara Mohawk Power Corp.
   - Philadelphia Electric Co.
   - Potomac Electric Power Co.
   - Public Service Electric & Gas Co.
   - Rochester Gas & Electric Corp.
   - Southern Services, Inc.
   - Toledo Edison Co.
   - Wisconsin Electric Power Co.
   - Wisconsin Power & Light Co.
2. Atomic Power Engineering Corp.:
   - Central Illinois Public Service Corp.
   - Central Louisiana Electric Co.
   - Central Power & Light Co.
   - Central & South West Co.p.
   - Cincinnati Gas & Electric Co.
   - Interstate Power Co.
   - Kentucky Utilities Co.
   - Middlewest Service Corp.
   - Northern Indiana Public Service Co.

2. Atomic Power Engineering Corp.—Con.
   Ottertail Power Co.
   Public Service Company of Indiana
   Public Service Company of Oklahoma
   Southwestern Gas & Electric Co.
   West Texas Utilities Co.
3. Atomic Power Associates of Iowa:
   Interstate Power Co.
   Iowa Electric Light & Power Co.
   Iowa-Illinois Gas & Electric Co.
   Iowa Power & Light Co.
   Iowa Public Service Co.
   Iowa Southern Utilities Co.
   Peoples Gas & Electric Co.
   Sac County Electric Co.
4. Atomic Power Associates of Kansas:
   Central Kansas Power Co.
   Empire District Electric Co.
   Kansas City Power & Light Co.
   Kansas Gas & Electric Co.
   Kansas Power & Light Co.
   Western Light & Telephone Co.
5. Information Exchange Center:
   Carolina Power & Light Co.
   Duke Power Co.
   South Carolina Electric & Gas Co.
   Virginia Electric Power Co.
6. Foster Wheeler, Pioneer Service and Engineering, Diamond Alkali:
   California-Oregon Power Co.
   Kansas Gas & Electric Co.
   Louisville Gas & Electric Co.
   Northern States Power Co.
   Oklahoma Gas & Electric Co.
   San Diego Gas & Electric Co.
   Wisconsin Public Service Co.
7. Nuclear Power Group:
   American Gas & Electric Service Corp.
   Central Illinois Light Co.
   Commonwealth Edison Co.
   Illinois Power Co.
   Kansas City Power & Light Co.
   Pacific Gas and Electric Co.
   Union Electric Company of Missouri
8. Pacific Northwest Power Co.:
   Montana Power Co.
   Pacific Power & Light Co.
   Portland General Electric Co.
   Washington Water Power Co.
9. Pennsylvania Power & Light Co.
10. Puget Sound Utilities Council: Puget Sound Power & Light Co.
11. Rocky Mountain Power Group:
   Arizona Public Service Co.
   Idaho Power Co.
   Public Service Company of Colorado
   Utah Power & Light Co.
12. Yankee Atomic Electric Co. (12 companies). (See exhibit 1.)
13. Minnesota Nuclear Operations Group: Northern States Power Co.

Mr. LINDSETH. As further indication of the scope of interest and activity in atomic power generation among investor-owned companies, a total of 87 companies today have access permits and 95 companies are participating in 13 organized research and study groups. These are listed in exhibits 3 and 4, to which we have made reference.

Altogether, eliminating overlapping, there are 104 utility companies actively participating in the atomic field, in study, access permits, research, development and construction.

The investor-owned electric industry also has been aware of the importance of developing nuclear powerplants of the smaller sizes. As an indication of the forward-looking attitude we have taken in considering this part of the atomic power program, we quote from a report of the Edison Electric Institute Committee on Atomic Power, dated December 14, 1955, a report from our committee to the institute:

> Present indications are that the economics of power reactors of the 5,000 to 40,000 kilowatt size may for some time be adverse in virtually every section of this country. As the art advances, however, the economics of reactors in this size range undoubtedly will improve. With this prospect in mind, we urge that our industry, particularly the smaller companies, perhaps by group action, actively study the possibilities of undertaking the building of small reactors as part of this program. This will not only give the smaller groups an opportunity to participate in developing reactor units of a size in line with their possible use, but it should lessen the inequitable effect of the preference clause (sec. 44, Atomic Energy Act of 1954) by assuring that private capital to the fullest possible extent is cooperating in the development of each promising reactor design, whether large or small.

Plans of an investor-owned utility, the Pacific Gas & Electric Co., participating with General Electric Co., to build a 5,000-kilowatt atomic powerplant have already been reported, just within the past week, and are very significant.

It is significant that this same report of our committee, dated December 14, 1955, looked ahead, too, to controlled thermonuclear fusion as a prospective source of heat for electric power generation, and I quote again from the report of the committee:

> * * * Even though the commercial use of this heat source may be down the road, our industry cannot afford, in the discharge of its duties and responsibilities to its respective areas, to its consumers, and to its investors, to stand by without thoroughly exploring the entire subject. This should contemplate studying the basic problems, the research and developmental work under way, and the effect of that both on current technologies of generating power and on the technology of nuclear fission power just on the threshold of development. It cannot afford to overlook any of these opportunities in view of the tremendous investment represented by its present plant and facilities, in view of the sizable investment already committed to the development of that art that will undoubedly be made in the coming years. If the industry is to judge wisely and soundly in all these matters, it is important that it have the maximum opportunity to look beyond the present atomic projects; that it be able to look just as far as human thought presently can visualize new methods and procedures for the generation of energy.
>
> Accordingly, the committee has in mind considering an approach to the Atomic Eenergy Commission with a view of arranging for representatives of our industry to thoroughly familiarize themselves with the entire subject of thermonuclear fusion, with its present state, and on a continuing basis as developments evolve.

The recent action of the Atomic Energy Commission in including for the first time in the list of categories of restricted data available to access-permit holders information related to controlled thermonuclear processes is an important step toward meeting this need. We commend the Commission for taking this important step.

On the other hand, as mentioned above, certain of our previous recommendations regarding revision of the statute were not accepted. One of these had to do with the disposal of byproduct energy produced by facilities owned by the United States.

As finally passed, the act contains a preference clause governing the disposal of such electric energy in a discriminatory manner. Based on past experience with the preference clause as enforced through application of other Federal statutes over a long period of

years in a manner completely unfair to taxpayers generally, and particularly to customers of the investor-owned power industry, the Edison Electric Institute favors amendment of the 1954 act so as to provide a nondiscriminatory means for disposal of electric energy to take the place of that now prescribed by section 44.

The institute also advocates deletion of the unfair, unjust preference clause relating to license applications, as contained in section 182 (c) of the act.

In conclusion, the committee on atomic power of the Edison Electric Institute agrees wholeheartedly with the fundamental principle expressed by the Panel on the Impact of the Peaceful Uses of Atomic Energy that:

> * * * private enterprise should carry a substantial part of this research and development program, including especially the construction of full-scale "demonstration" plants.

We commend, too, the principle expressed by this panel that:

> * * * atomic power be exploited as a source of electric power at a rate consistent with sound technological, economic, and public policy considerations.

The important steps already taken by our industry indicate a clear-cut endorsement of these principles and should provide assurance of its willingness and ability to undertake a major responsibility for the commercial development with private capital of other promising reactor designs that may be found to have real economic promise.

We do not feel that there is any present need for the Government to embark on a large-scale program of building "demonstration" reactors with taxpayers' funds, particularly in the present state of knowledge of the art.

In our opinion, the present plans for developing various types of reactors should be pursued in an orderly way and additional steps should be taken as fast as the development of the art justifies. This is the businesslike way.

In our opinion, the expenditure of additional tremendous sums of money to build reactor capacity in the present state of knowledge of the art would be unwise, especially the building of duplicate facilities, particularly in view of the prospect of rapid obsolescence of initial atomic power facilities.

The United States, compared with most other large nations, is blessed with rich fossil fuel resources. The efficiency in converting these fuels into electric power has made great strides in the past and continues to be improved. We feel, nevertheless, a strong obligation to our customers to go ahead and develop atomic powerplants. At the same time, in doing so, we cannot be unmindful of economic factors.

You have heard testimony from utility executives as to specific features in existing laws and regulations that may be retarding progress. These are matters upon which the companies directly involved can best express opinions.

This committee therefore takes no position with respect to such matters at this time, other than as I have discussed in connection with sections 44 and 182 (c).

The industry generally feels that the plans of the companies that are proceeding with constructing and operating atomic reactors with aggregate capacity of more than a million kilowatts, and at a cost in

excess of $300 million, are sound and presently ample in view of the current knowledge of the art.

As additional opportunities or needs develop, it is reasonable to expect that further steps will be taken by industry, with emphasis not merely on quantity of nuclear power capacity as measured in kilowatts, but on advancing the quality and soundness of nuclear power applications. That is the general way that developments in a new field have always been worked out in this country, and industrial progress under this approach has been outstanding.

Again, we of the Edison Electric Institute, through our committee on atomic power, express our appreciation for the opportunity to appear and present these facts and data.

Chairman ANDERSON. Thank you.

Coming back to that reference at the bottom of page 4, section 182 (c), there are two categories in that. Do you object to both or just one?

Mr. LINDSETH. We object to the category which states that in the case of conflicting applications, preference be given to public agencies and cooperatives as distinct from taxpayer investor-owned enterprises of the corporation type.

Chairman ANDERSON. The first one had to do with saying:

> The Commission, in issuing any license for a utilization or production facility for the generation of commercial power under section 103, shall give preferred consideration to applications for such facilities which will be located in high cost power areas if there are conflicting applications for a limited opportunity for such license.

You do not object to that?

Mr. LINDSETH. That is not our meaning of preference and discrimination.

Chairman ANDERSON. Where it says:

> * * * where such conflicting applications resulting from limited opportunity for such license include those submitted by public or cooperative bodies, such application shall be given preferred consideration.

Mr. LINDSETH. That is the discriminatory paragraph.

Senator BRICKER. Mr. Lindseth, I observed on your last page you agree with Mr. Sporn that the problem of insurance that we have is a problem that we have to meet at an early date?

Mr. LINDSETH. Yes, that is, and I agree.

Senator BRICKER. Outside of that and the discriminatory section or preference section, whatever you want to call it, would you agree that the 1954 act meets the immediate needs and is constructive in its approach, looking toward private development of atomic generation of power?

Mr. LINDSETH. I would have to answer that question as an individual as distinct from a representative of my committee, because my committee has not passed on it. Yes.

Senator BRICKER. You head one of the great companies in the country?

Mr. LINDSETH. I am speaking now, not on behalf of the committee.

Senator BRICKER. Thank you. It is very encouraging to see this report and to see the amount of money that private industry is willing to commit or has committed and the amount of energy it will generate. I think it is a long step forward under the act for the short time the act has been in existence. I think that truly the results of this act of 1954, Mr. Chairman, have been encouraging.

Private industry is moving in much more rapidly than I thought, and I do hope we can solve this insurance problem constructively.

Chairman ANDERSON. Mr. Price?

Representative PRICE. I was just wondering what the gentleman's thought would be on the amount of research that has gone into the various projects and which come from the Atomic Energy Commission, just how much the different industries avail themselves of this service.

Mr. LINDSETH. Well, the answer, qualitatively, is very, very heavily.

Representative PRICE. Do you have any suggestion where the Atomic Energy Commission might improve that type of service to the industry?

Mr. LINDSETH. As to the availability of research and similar information?

Representative PRICE. Yes.

Mr. LINDSETH. I have mentioned the specific matter of access to thermonuclear data which only recently has been made available in a new category of data available under access permits.

The problem of material testing and the behavior of materials under high neutron flux conditions is an acute one and there we are handicapped by the sheer lack of adequate testing facilities the country over. Some new test reactors are in process of construction and they will help.

Representative PRICE. Do you think that the industry itself should undertake these tests or that it should remain within the province of the Atomic Energy Commission?

Mr. LINDSETH. Well, I hope, through an expanded program, much of it in our engineering colleges and universities, we will have an expanded program of test reactors around the country. Materials are a very serious limiting factor in the engineering design of reactors and I would hope, over the course of the next couple of years, there will be a considerable number of test reactors in "private hands", such as universities, industrial testing laboratories and engineering colleges to further this testing program.

Representative PRICE. I think it is obvious that during the first stage of this program that is now underway that the industry will have to draw almost entirely upon the Atomic Energy Commission for the basic and fundamental knowledge on reactors.

Mr. LINDSETH. Yes, I think that is a fair conclusion.

Chairman ANDERSON. Thank you, Mr. Lindseth.

Mr. LINDSETH. Thank you, gentlemen.

Chairman ANDERSON. Mr. Biemiller?

Mr. Biemiller, state your name and your position and who you represent here today, for the record.

STATEMENT OF ANDREW J. BIEMILLER, LEGISLATIVE REPRESENTATIVE, AMERIAN FEDERATION OF LABOR AND CONGRESS OF INDUSTRIAL ORGANIZATIONS

Mr. BIEMILLER. Mr. Chairman and members of the committee, my name is Andrew J. Biemiller. I am a legislative representative for the American Federation of Labor and Congress of Industrial Organizations, with offices at 901 Massachusetts Avenue, NW., Washington, D. C.

May I also add, Mr. Chairman, that I have been asked by the metal trades department of the AFL–CIO, by the International Association of Machinists, and by the International Brotherhood of Boilermakers and Blacksmiths, to testify in their behalf. I understood they subscribe to the basic tenets of the statement I am about to present.

Furthermore, before presenting my formal testimony, Mr. Chairman, I should like to say, on behalf of the AFL–CIO, that we highly commend you for appointing the McKinney Panel. We feel that the results have been very good.

On the whole, as you will note, we concur with most of the work done by the panel but, above all, Mr. Chairman, we believe that one thing the panel has done is finally taken a real step forward in filling the gap that the AEC left when it did not furnish a report to the Congress and the people under section 7 (b) of the old McMahon Act. Again we commend you for the action you took and appreciate the work the panel members did.

In presenting my testimony today I desire to first present to this committee the text of two resolutions adopted by the merger convention of the AFL–CIO in New York on December 8, 1955. These two resolutions on atomic energy and power establish the broad framework of labor's recommendations in the areas under the jurisdiction of this committee.

These resolutions read as follows:

ATOMIC ENERGY

Developments in atomic science have reached the stage of technologically translating theoretical scientific knowledge into increasingly practical peaceful application. A widening impact on most of industry can be expected soon.

At the Geneva Conference on the Peaceful Uses of Atomic Energy, an impetus to early application of many uses was given by broadened declassification of secret atomic information and a freer exchange of scientific discoveries than had existed in many years. Further developments along this line will undoubtedly result from the establishment of an international agency on atomic energy, which is now under active consideration by the United Nations.

To organized labor these developments provide an opportunity and a challenge to serve as a public interest force seeking the maximum application of this new science and industry for the broadest beneficial uses for all of mankind. Organized labor must act also to assure maintenance of adequate protection from harmful radiation both for workmen exposed to radioactive materials and for the general public.

Senator BRICKER. Mr. Chairman, may I say in passing that in the third paragraph of the resolution there is a statement that:

* * * organized labor must act also to assure maintenance of adequate protection from harmful radiation both for workmen exposed to radioactive materials and for the general public.

I want to commend you on that. That is one thing that concerned this committee in drafting the bill all the way through and after at every point of the bill.

In the act of 1954 we did go all the way in emphasizing the protection of the public and the workers in the utilization of the atomic energy. It is something that has concerned me personally very, very much. I do not know whether the art has reached the point yet where it is safe or not. These insurance discussions this afternoon emphasized this portion of the resolution.

Mr. BIEMILLER. Senator, I have some comments later on in my testimony on that point, and I might add further that, in addition to what

I am saying here today, that on the 19th of March I am going to address the Atomic Industrial Forum in which we will more fully develop some of our thinking on this matter and make it available to the members of the committee.

Senator BRICKER. We were thinking and directing the Commission and emphasizing at every turn the necessity of the application of the greatest diligence that they can give in protection to the public.

Mr. BIEMILLER. It is certainly a commendable attitude on the part of the committee and one I am sure will continue.

The worldwide importance of the growing application of nuclear science led the freed trade unions of the world, through the International Confederation of Free Trade Unions, to convene an International Conference on the Peaceful Uses of Atomic Energy, in Brussels, Belguim, last August, just prior to the Geneva Atomic Conference. The ICFTU conferees, while supporting the measures taken by various governments and the United Nations, called especial attention to the need for—

Democratic control over the production and use of atomic energy;

The association of the free trade unions with such control;

The application of all necessary safety measures in plants extracting and producing fissionable materials, producing atomic energy, and using its products;

The ensuring of high social standards in plants extracting and producing fissionable materials and atomic energy, with the cooperation of the free trade unions, in the first place by means of collective bargaining. Adequate safeguards for the rights and interests of the workers wherever displacement of manpower might result from atomic developments.

Here in the United States, where the greatest investment of public funds has been made in developing this new technology, action for more rapid and broadened application of peaceful uses of nuclear science must be urged upon the Atomic Engery Commission.

After several years of hesitation, the Commission finally in the past year has been jogged into stepping up the pace of both Government and private development for peaceful purposes, but still is proceeding slowly and, as far as the public is concerned, largely in the dark.

In stimulating a more aggressive program of development for civilian uses, the AEC and the Nation must remain alert to the danger of commercial monopoly. The Government must vigorously enforce its authority to prevent any firm from using patent rights to gain monopolistic control of any important phase of nuclear development.

A relatively few industrial giants have had the opportunity as contractors for the Government in the military development phases of the atomic program to gain special know-how and personnel in this complex field. They must not be allowed to convert their head start or inside knowledge into an unduly favored position or exclusive control of any aspect of private application.

The widening of private activity in this field must take place on a truly competitive basis to bring to the American people the benefits to which their investment in atomic energy entitles them. The Government must therefore encourage participation by as wide a variety of responsible private enterprises as practicable and must assure such enterprises an equal opportunity through appropriate provisions for access to necessary atomic information and resources: Now, therefore, be it

Resolved, That the AFL-CIO urges the following as fundamental elements in an enlightened United States atomic energy program in the best interest of the American public and the world as a whole:

(1) The United States should participate wholeheartedly in the formation and operation of an international agency on atomic energy adhering to the principles urged upon the members of the United Nations by the ICFTU.

(2) The United States should encourage, and participate in, regional agreements under the United Nations Charter to make possible for several countries within the appropriate region to assure mutual availability of capital, technical know-how, and equipment, as well as to develop common programs in whose benefits all would share.

(3) Development of peaceful uses of the atom should be promoted as rapidly, fully, and equitably as possible to hasten the day when the atom's potential is reflected in improved standards of living for all.

(4) The tasks of overcoming technological obstacles and of putting atomic energy into practical everyday civilian use in this country, including the construction of large-scale power reactors, must be carried through both by the Federal Government itself and by expanded participation of private enterprise.

(5) In encouraging broadened participation by private industry, the Federal Government must not relinquish its responsibility to assure that atomic energy is developed and applied in the public interest and under standards established and maintained to that end. Federal policy must prevent the development of monopoly in any aspect of this new industry.

Full consideration must be given to the probable need for Federal standards to be established either through the licensing power of the Atomic Energy Commission or by legislation.

(6) Since expanded peacetime atomic development will have a marked economic and social impact, its likely effects must be weighted carefully in advance and a program must be drawn to meet the human needs arising out of any dislocation of existing industry.

(7) The public must be kept informed fully of the Nation's peacetime atomic plans and progress. The program of easing and eliminating secrecy restrictions on nonmilitary technical information must be greatly accelerated.

(8) The growth of atomic energy operations requires that particular attention be directed to the development of—

(*a*) A sound labor-management relations program, with maximum emphasis on free collective bargaining as an integral part of broadened private enterprise.

(*b*) Effective health and safety standards to meet the special hazards presented in work with radioactive materials.

(*c*) Provisions for fair compensation for workmen suffering radiation injury.

(*d*) A voluntary manpower program to assure a necessary supply of competent skilled labor to meet our atomic needs.

(9) A statutory labor-management advisory committee should be established to advise the Atomic Energy Commission in developing these programs.

POWER

There is now general recognition, as organized labor has long advocated, that the expanding economy of the United States needs additional power and energy beyond even the most optimistic estimates of the recent past. The best informed sources predict the necessity of increasing the available supply from the present level of 7.7 kilowatt-hours per man hour of work in all of industry to 14 kilowatt-hours per man hour of work by 1970.

The need for increased power also stems from the increased use of electrical devices and processes in industry, in agriculture, and in the home.

Many new industries use electroprocess methods which require large amounts of electricity. Aluminum and titanium are two new industries in this category. Application of automation in industry generally requires tremendous increases in the use of electric power. The new atomic industry is both a large user and potential source of electric power. This total use of electric power at major AEC installations will increase in the one year from 1955 to 1956 by 20 billion kilowatt-hours. Total AEC use of electricity which constitutes 9 percent of sales to consumers in 1955 will in 1956 increase to 12.8 percent of total consumption of electricity in the entire United States. Part of this increase could be obtained from nuclear power reactors.

There are many new appliances in the homes. As additional power becomes available, more of it is used in the home for these appliances, and all of society benefits from the increased use. Experience in low-cost areas proves that the increase in use of power brings a higher standard of living in the home and on the farm, as well as expanded output and employment in the factory and in the mill. The housewife benefits. The worker benefits, when low rates bring increased use. While residential users in Rhode Island paid $8.74 for the identical amount of power which cost $4.92 in Tennessee, the average residential use in Providence, R. I., was 1,230 kilowatt hours contrasting with an average residential use of 7,020 kilowatt hours in Chattanooga, Tenn.

We are proud of the achievements of the TVA and will oppose all efforts to weaken or cripple this outstandingly successful program. We want no more Dixon-Yates proposals.

Only the Federal Government can provide effective leadership to develop our large river basins, and only the Federal Government can provide for the

multipurpose planning that can bring the maximum flood control, power, navigation, recreation and irrigation which so many of our river basin areas need.

Hydroelectric power without expanding nuclear and conventional fuel power plants cannot meet the total needs of our expanding economy. We must develop an expansion of our total supply. Public policy should encourage the development of power using all possible sources of energy with both public and private ownership. We believe that, whatever the form of ownership, workers employed in the construction or operation of power plants or the sale of electric power, are entitled to the same rights, benefits, and privileges of free organization and collective bargaining as workers in industry generally. We call for the repeal of any special restrictions on collective bargaining rights of workers in electric power industries; now, therefore, be it

Resolved, That the AFL–CIO in convention assembled supports programs for the expansion of electric power supply at the lowest feasible cost practical under the terms of programs which have been established since the use of electric power became widespread throughout the country.

1. The Federal Government should encourage the development of power using all possible sources of energy with both public and private ownership.

2. We ask the Federal Government to provide effective leadership to develop our large river basins. Specifically, we call for the earliest possible congressional action for the authorization and construction of the high dam at Hells Canyon on the Snake River.

3. We call upon the various State governments involved to repeal legislation which denies to employees of publicly or privately owned electric power systems collective bargaining rights and privileges available to workers in industry generally in their respective states.

In addition, a number of representatives of various AFL–CIO affiliates were invited to participate in some of the seminars held by the staff of the McKinney panel, and AFL–CIO president, Walter P. Reuther, sat as a member of the panel itself.

Panel member Reuther signed the panel report.

In a "separate opinion", he stated that he signed the report because he was "in agreement with its general conclusions and recommendations." Nevertheless, he advised the panel that he—

* * * wished to exercise the usual privilege accorded to members of such advisory groups in submitting on (his) own behalf a separate statement of views concurring with the report in general but differing in conclusions and emphasis on particular points.

Mr. Reuther was not accorded that privilege and has undertaken separately a partial distribution of this separate opinion. So that the members of the committee and the Congress in general might have an opportunity to read this separate opinion, I offer it here and now as a part of my prepared statement for inclusion in the record, and request that it be included as part of my statement.

Chairman ANDERSON. That may be done.

(The information referred to appears on p. 566)

Mr. BIEMILLER. The conclusion of all of these various resolutions and statements coincide very closely with the thinking expressed by AEC Commissioner Thomas Murray here when he called for a policy decision that would lead to the establishment of a crash program to secure once again the lead for the United States in the peaceful application of atomic energy.

It is clear from the testimony which this committee has heard that in spite of all of the pledges of investment, when and if any of the private enterprise plans now being considered are effectuated there is little, if any, actual decision to proceed beyond the planning stage. Every time this committee meets there are promises of early action. Very little is accomplished until the committee meets again, when the

promises of early action are again renewed conditional on the solution of some new problem.

The panel recommendation No. 2, page 2 of the panel report, that in the event that industry did not take on the full risks and burden the Commission should support a program to bring atomic power to a point where it can be used effectively and wisely on a competitive basis, even to the construction with public funds of one full-scale demonstration plant of each major reactor size and type, we feel requires this committee to make the policy decision called for by Commissioner Murray, and order the AEC to proceed with the construction of at least one full-scale demonstration plant of each major reactor size and type.

One way to proceed would be for this committee to take up the proposals made by Senators Gore and Morse for the construction of reactors in various parts of the country as provided in S. 2725.

This would implement recommendation No. 3 of our resolution which calls for—

> development of peaceful uses of the atom should be permitted as rapidly, fully, and equitably as possible, to hasten the day when the atom's potential is reflected in improved standards of living for all.

Passage of the Gore bill would also support panel recommendation No. 3, page 2. We feel likewise that this endorses panel recommendation No. 4 and the basic position of Panel Member Reuther.

Chairman ANDERSON. May I say, Mr. Biemiller, that we had not considered taking up the Gore bill previously because I explained to the author of it that we would be dealing with this question of reactors, the progress being made, at this hearing and we thought we did not need to cover that same ground twice in the hearing we are now holding in which you will give us information.

Mr. BIEMILLER. We trust you will inform us when those hearings will take place.

Chairman ANDERSON. They are taking place now. In this hearing here, we are trying to get some information.

Mr. BIEMILLER. I understood you to refer to additional hearings.

Chairman ANDERSON. Then the decision will be reached as to whether we need additional hearings or whether the material now available will be satisfactory.

Mr. BIEMILLER. Right.

The public policy decision called for by Commissioner Murray and in panel recommendation No. 4, page 2, we believe requires that the United States not be left behind in the effort to achieve wide scale peaceful use of atomic energy. The United Kingdom's program is proceeding, according to their authorities, toward a competitive rate of electric power production. In the Soviet Union claims of real progress have been made. In the struggle for influence in the undeveloped and neutralist nations in the world, offers of assistance in peaceful use of atomic energy may be a major influence in winning these nations to the democratic way of life.

Gordon Dean, former chairman of the AEC, last June said in this connection:

> Today in many parts of Europe, Asia, Africa, and the Western Hemisphere the lack of power is holding back economic and social development. As one high placed observer said of Europe, "Next to peace, electric power is the primary

interest of many governments. Unless something is done about it, the lights will grow dim over much of Europe."

Mr. Dean continued:

But let's face it—what they want is atomic power, and American industry would like to supply the reactors to produce it. We are simply not implementing the President's "Atoms for Peace" proposal.

Before we export power reactors we must build some and prove that they work. The place to do that is here in the United States. It appears clear from the testimony which has been presented that private industry alone cannot proceed to take the risks and secure the risk capital which is needed for the first "demonstration" reactors.

India has been offered atomic aid by Soviet Premier Bulganin.

Japan is in desperate need of additional electric power. Any further delay may bring us to the stage when even a crash program may come too late.

Public policy requires an end to the delays which we have seen again and again. The panel recommendation No. 4 and Walter Reuther's separate opinion coincide with the policy attitude of organized labor that peaceful uses should be permitted as rapidly, fully, and equitably as possible.

Nor is the need for electric power being totally met in this country. We of organized labor daily see the changes being wrought in industry which through increased application of technology and automation are increasing the consumption of electric power per man-hour of work. The present level of 7.7 kilowatt-hours per man-hour of work will rapidly increase in the immediate future.

Reliable estimates anticipate a consumption of 14 kilowatt-hours per man-hour of work by 1970. Likewise, consumption in the home is increasing by leaps and bounds. New electrical appliances, air conditioning, and space heating will put a tremendous load on the demand for electric power.

The AFL–CIO resolution on power therefore calls for the Federal Government—

(to) encourage the development of power, using all possible sources of energy with both public and private ownership.

Construction of power reactors either under the Gore bill or the Morse proposals will provide a test of economic costs which are not available today. Once the comparative costs are available and the first projects can be improved the most economic designs can be made available for construction by private industry. Thus the groundwork will be laid for effectively developing a reactor industry, without either Government or private monopoly.

Mr. Chairman, these recommendations coincide as well with the report of the seminar on the labor aspects, which I had the honor of chairing as discussion leader under the auspices of the McKinney panel.

Both the labor seminar and the McKinney panel were concerned with the health and safety problems which result from radiation hazards. We cannot look with equanimity on any recommendation which at this time will delegate to the States jurisdiction of health and safety in this new field.

The AFL–CIO urges that particular attention be directed to effective health and safety standards to meet the special hazards presented

in work with radioactive material (resolve 8 (a), resolution on Atomic Energy). We are therefore concerned with the introduction of H. R. 8676 under which the unilateral certification by the governor of any State requires the AEC to relinquish jurisdiction of health and safety matters in the areas specified in such certificate.

The labor seminar recommended instead, and I quote:

> The Federal Government must carry the responsibility for establishing and enforcing the minimum standards required for nuclear reactors and radioisotope handling to assure the maintenance of public and worker health and safety.

Senator BRICKER. That is true under the law now?

Mr. BIEMILLER. That is true under the law now, correct, and we want to keep it that way.

Chairman ANDERSON. Do you not feel, however, that there might be some value—I am sure I have not formed an opinion yet—in the Atomic Energy Commission meeting with health and safety representatives of the various States to see how far they can go toward setting up some future operation in this field?

They have certain powers now in the States that probably would be undesirable to have a conflict between Federal and State authorities in that field. I am not a lawyer so I can speak very freely.

If the Federal Government passed a law saying that the Federal Government should have jurisdiction in that field and yet, by general consent, that was the feeling where the State governments had power, as they do have in most other matters, we might run into conflict in jurisdiction. I was hoping that that might be avoided by such close alliance between the Federal Government and the State governments.

Mr. BIEMILLER. Mr. Chairman, may I comment briefly?

Chairman ANDERSON. That is why I raised it.

Mr. BIEMILLER. First of all, let us make it clear that the bill, H. R. 8676, goes way beyond any matter that you have mentioned today.

Chairman ANDERSON. I am not talking about the bill.

Mr. BIEMILLER. Under the present law, there have been meetings held with various safety and health groups. Briefings have been given by the AEC on the standards which they have produced. There have also been a couple of informal meetings held with labor people to discuss this problem. I do not think we have gone into it as fully as we might have, but that is for the future. We expect to meet again and consult.

Senator BRICKER. The fact is that all of the health and safety features are under the reserve powers of the States. Under this authority, wherein the Federal Government has nationalized special nuclear material, the Federal Government acting through the Atomic Energy Commission, can make prerequisite conditions to the utilization of the special nuclear material in the reactors. Therefore, it does assume some control.

Mr. BIEMILLER. Correct.

Senator BRICKER. I think Chairman Anderson's suggestion of the cooperative effort, as long as the standards are set by the Atomic Energy Commission, would be very, very helpful.

Mr. BIEMILLER. We would not quarrel with a thoroughgoing honest cooperative procedure, provided that the setting of standards is clearly left with the Atomic Energy Commission.

Senator BRICKER. I think any State organization would want that because of the superior knowledge, the experience that AEC has that is not available to any State authority that I know of anywhere.

Chairman ANDERSON. I would agree completely with what Senator Bricker has just said. It seems to me to be very hard, even though there has been a great deal of atomic development in my State, to go out to the State health department of my State and say, "Set up a system of standards." I do not think they could do it.

Mr. BIEMILLER. I do not either.

Chairman ANDERSON. I think the Atomic Energy Commission has taken the right step, but I believe that they never had a conference of this nature that embraced all the States in a formal way until last week.

Mr. BIEMILLER. I believe I stated earlier "informal conferences."

Chairman ANDERSON. Yes. All I am trying to say is that I was anxious to have your comment on whether or not we should continue to encourage meetings like that to be held because I am not anxious to get into a conflict between the Federal Government and State governments as to whose responsibility it is.

It seems to me that if the Atomic Energy Commission continues in the right path of calling these groups in and trying to meet with them, that we might develop a thoroughly cooperative approach to this in which, as you have said, the Federal Government will set the standards and then decide if and how the States will administer them.

Mr. BIEMILLER. I think we could work out a reasonable agreement on that basic policy, Mr. Chairman.

Chairman ANDERSON. Thank you.

Senator BRICKER. There cannot be too much effort put on the safety features, I assure you of that. That is my feeling and I think it is the sentiment of the committee.

Mr. BIEMILLER. We certainly agree with you, Senator Bricker.

The panel's recommendation No. 6, under "medicine and public health," does not meet the requirements of the present situation. The labor seminar discussed this problem extensively, particularly from the point of view that a worker who had been extensively exposed to radiation might, as a result of an automobile accident, or for some other medical reason, face the possibility of extensive X-ray radiation. Part of the radiation danger stems from its cumulative effect. The labor seminar therefore recommended that each worker be given a copy of a tally sheet recording his exposure.

In addition, in view of the uncertain extent of possible injury to future generations, the labor advisers agreed to recommend to the panel the necessity for limiting the work time in which atomic energy employees are subject to the possibility of exposure. They pointed out that as early as 1949 the ILO recommended a model code establishing a 35-hour week with at least 4 weeks' annual vacation, and a 3-month period in some other work every 15 months for workers exposed to radiation. We are disappointed that the McKinney Panel did not adopt any of these recommendations.

Likewise, we feel that some of the emphasis in current discussions regarding the establishment of insurance programs are headed in the opposite direction to our recommendations for assuring adequate compensation for workers who do suffer injury or illness from the effects of radiation.

We pointed out in our report that existing workmen's compensation laws are inadequate for this purpose. In line with the convention resolution (sec. 8 (c) above), we urged in our report that compensation legislation covering radiation damage should not contain a statute of limitations inasmuch as radiation injury and the nature and extent of its effect may not be evident for a considerable time after exposure.

Likewise limitations on medical benefits should be waived for workers who have suffered radiation injury as there is no adequate basis for determining equitable limits and the paramount concern should be to provide victims of radiation injury with all necessary medical attention.

The labor seminar made a number of recommendations regarding the whole problem of manpower requirements for the expanding atomic energy industry. We support programs for increasing the number of trained scientists in view of the current shortage, but we also call upon the Commission and industry to use to the maximum the skilled workers available in the United States.

We recommended that workers available in the present labor pool should be given opportunities for training and upgrading as one means of meeting the need for qualified workers in all sections of the atomic industries.

We urged that plans be drafted to minimize the effect of worker dislocation in industries which may be adversely affected by the expanding peacetime use of the atom, and that for these workers training and the development of new skills be made available so that they will not individually bear the brunt of the transition which the impact of peacetime use of atomic energy will bring on competitive industries.

In Oak Ridge recently, opportunities for training and upgrading were announced for some job classifications but were withheld from everyone currently paid on an hourly basis. Opportunities for training and upgrading should be available generally on the basis of merit and ability. It is our opinion that most persons with a high school education, plus specialized training in a craft or skill, can become proficient employees for atomic industry.

LABOR-MANAGEMENT ADVISORY COMMITTEE

We in organized labor believe there is a particular need for the establishment of a statutory labor-management advisory committee in the atomic field to serve several purposes. Such an advisory committee could serve as a continuing focal point for channeling public expression on basic policy matters. It would serve to provide the Atomic Energy Commission with broad-based policy recommendations on matters which cannot be revealed fully to the general public.

The expert advisory committee is required to meet the variety of special labor relations, manpower, and working-condition problems in atomic industry. These include such complex matters as:

1. Collective bargaining processes and obligations in an industry so closely linked to the national welfare;

2. The difficulties posed by on-the-job security regulations;

3. The need for retraining and developing an adequate supply of competent and cooperative skilled labor, and

4. The resolution of health and safety problems arising in atomic operations.

We hope the committee will see fit to report legislation to create a labor-management advisory committee to bring the best brains and experience of both labor and management to the service of the Atomic Energy Commission.

Now, Mr. Chairman, may I add one more point? I had not intended, and do not now intend, to discuss in any detail the more narrow aspects of labor-management relations. This matter was not dealt with in the labor seminar report nor by the McKinney panel in its report. However, in view of the comments and recommendations made by one of the trade-union witnesses this morning, in which he recommended the discontinuance of the atomic energy labor relations panel in favor of a tripartite panel of labor, industry and public members. I wish to call the committee's attention to the fact the AFL-CIO national organization has not taken such a position. If this committee is going to go into the more narrow field of labor-management relations, we would like to have the opportunity for Mr. James Brownlow, president of the metal trades department, to also voice his views on this question.

I simply put the statement in the record because, as I understand it, you will probably not be going into the details of labor-management relations.

Chairman ANDERSON. We will try to be sure and make a memorandum on that. I hate to make promises because sometimes we forget it and legitimately forget it and do not mean to forget it. Then somebody says, "But you promised that you would do it."

I say that to you and to the best of our ability we will try to bear that in mind and at least your request has been incorporated in this record. We will try to watch it and see that it gets done.

I do want to comment, on page 10 where you say:

> In Oak Ridge recently, opportunities for training and upgrading were announced for some job classifications but were withheld from everyone currently paid on an hourly basis.

I know that you are familiar with the fact that at Oak Ridge there is a training school for welders, for example, and that they have gone through a great many employment opportunities and tried to upgrade and to train these workers so that we have thousands literally of skilled craftsmen who have received their training under the Atomic Energy Commission program.

I commend that and I hope, as I am sure you do, that it continues to expand and grow as the years go by.

Mr. BIEMILLER. Quite so and I want to emphasize the point we have made. We feel strongly and I am sure most of you committee members would agree with us that in the pool of skilled American labor there are many, many people who, with additional training can become extremely competent workers in this area. We would hate to see this vast pool possibly overlooked by too strong an insistence upon university training at this stage of the infant atomic industry.

All we are asking for is to make certain opportunity is given to a skilled craftsman to better his condition. Such institutions as have been established to forward that aim certainly have our approval. We hope they will prosper and grow and that there will be many more of them.

I think you also know Mr. Chairman, from discussions you have had with some of the representatives of the international unions affiliated with the AFL–CIO, that many of our unions are conducting their own training programs and are paying a great deal of attention to the problems that have been and are being created by the development of the atomic industry, and I can assure you that there will be ever increasing attention to this problem on the part of the leaders and the members of organized labor.

Just to add one more point on this Oak Ridge situation, what has happened there is that an offer has been made to the weekly paid people. They have been given an opportunity to go to school and better their training, but the same offer has not been made to the hourly paid people.

We think this is a rather shortsighted policy.

Chairman ANDERSON. Would you care to have Mr. Brownlow submit a statement on this proposal that was made this morning so that we have that in the record following the other recommendation? I will leave it to you and I will not ask for your decision on that now.

Mr. BIEMILLER. I will take it up with the metal trades department.

Chairman ANDERSON. This we will strike from the record, if you do not desire to do so. If you desire to do so, we will submit that statement at the conclusion of your remarks so that at least we will have both statements in the record.

Mr. BIEMILLER. Thank you, Mr. Chairman.

Chairman ANDERSON. Thank you very much.

Senator BRICKER. You give encouragement on the development of peaceful uses. All three of the members here today attended the Geneva Conference. The exhibits were interesting, illuminating, and in some cases encouraging.

The first day I was there, we went down to the exhibits of all the countries, not the commercial exhibits but the actual exhibits of the actual countries in the field for peaceful uses. There were great crowds everywhere and many countries were exhibiting. Russia was and the United States was. There was a crowd around all of them examining the exhibits, and the last day I went down there there were three people besides my wife and myself who were there looking at the Russian exhibits and they were so crowded around the exhibits of the United States that you could scarcely get through, and people were dictating to secretaries in every conceivable language almost. I left there very much encouraged that my country is doing its full share and is far ahead of any other country in the development of atomic energy in the field of agriculture, health and industrial uses.

Mr. BIEMILLER. I am very pleased to hear that and you remind me, Senator Bricker, in reference to the Geneva Conference, that I would like to give for the record an illustration of the kind of work which some of our international unions are doing to acquaint their members with some of the problems before us.

Right at the same time the Geneva Conference was held, the United Association of Plumbers and Steamfitters held a meeting on the campus of Purdue University, attended by some seven to eight hundred members of the union from practically every State in the Union, and some of the Canadian provinces, devoted to the discussion of problems of atomic energy.

Your reference to Geneva reminded me of this meeting because some of the papers that were read at Geneva were read for the first time in America at that conference sponsored by the Plumbers and Steamfitters Union. This union, like many others, is doing everything it can to acquaint its people with the problems and to furnish the retraining that is needed by the older journeymen and the basic training needed by the apprentices who come along.

Chairman ANDERSON. May I, in confirmation of what Senator Bricker stated, say that to me one of the most interesting parts of the American exhibit was the skill with which the parts, pieces, of our equipment had been put together. I am not a mechanic in any way but you would go to the Russian exhibit and see how, I would almost say, clumsily things had been put together, with not the same precision that our workers had seen to fit them together so that they made at least a nice appearing job.

I still think there is something worthwhile to having a nice-looking piece of work when they got through. It might not have been more efficient but it was certainly compact and nicely designed and when I got back to this country and went out to laboratory where some work was being done, I commented on this fact. The man in charge said that maybe one of the reasons is that our designers here go and work directly with the men who have to make it, those who are the craftsmen, the trade members, trade union members, labor union members who are dealing with the actual manipulation of these things at a later time.

Between the two of them, they have worked out better designs than if it had been conceived in somebody's mind and executed by a different person. I think if someone looks at some of the work that was done, although the Russians had some fine work, they could not help but be proud.

Mr. BIEMILLER. We are confident, Mr. Chairman, that when an opportunity is given for a combination of scientific and labor skills of the free workers of the United States, that we can outdo any slave labor approach at any time.

Chairman ANDERSON. Mr. Price?

Representative PRICE. Of course, I want to compliment Mr. Biemiller on his fine statement which contained many important and good recommendations. It shows a thorough study of the problem in every phase of the program.

While I join in the accolades of the American exhibit in Geneva, I hope we will not be so enthused about them as to overlook one significant point that you have made in your statement, and that is on the power reactor development program. I hope the committee will entertain the suggestion that you have made that we make this a national policy to take and maintain the world leadership in power development.

I hope that when we study that phase of your recommendations, we will do so very thoroughly because all the exhibits that were presented so far would be quickly forgotten and lost if we lost this leadership.

Mr. BIEMILLER. Thank you, Mr. Price, for your comment. I assure you that we are most anxious that we do not lose leadership in this field because, as we have said in our statement, certainly the future of the

whole free world may well depend upon whether we can get this program off the ground. We are sorely disappointed with the slowness that we have seen to date in getting the reactor program into real operation.

Chairman ANDERSON. Thank you.

Mr. BIEMILLER. Thank you, gentlemen.

Chairman ANDERSON. Is Mr. Campbell here?

STATEMENT OF JACK T. JENNINGS, ASSISTANT DIRECTOR, WASHINGTON OFFICE, COOPERATIVE LEAGUE OF THE UNITED STATES

Mr. JENNINGS. Mr. Chairman, I am Jack Jennings, assistant director of the Washington office of the Cooperative League. I am sorry that Mr. Campbell was grounded in Atlantic City this morning and was supposed to have been here.

With your permission, may I proceed?

Chairman ANDERSON. You go right ahead.

Mr. JENNINGS. If he does come in, with your permission I would like to introduce him and let him complete the statement.

Chairman ANDERSON. Any time.

Mr. JENNINGS. The league includes in its membership more than 2 million members of consumer, service, and purchasing cooperatives, in addition to more than 3 million members of rural electric cooperatives associated with the National Rural Electric Cooperative Association, and 8 million members of credit unions associated with the Credit Union National Association.

For the personal interest of several members of the committee, I would like you to know that this statement today is in effect a joint statement, with much of the material prepared by a former colleague of yours, Jerry Voorhis, executive director of the Cooperative League. Many of you served with Mr. Voorhis during the 10 years he was a Member of the House from California. He had an intense interest in these problems when he was in the House and, as a matter of fact, worked on the atomic energy legislation which eventually became known as the McMahon Act, charter of atomic development.

The 12 million American families who are associated with the Cooperative League of the USA takes quite literally the American ideals for democracy, independence, and self-help. They have risked their investments together to create new businesses geared directly to meeting their needs.

You gentlemen, as members of this committee, are familiar with many of these institutions, for they are credit unions, consumer cooperatives, housing and homeownership cooperatives, farm supply cooperatives, and rural electric cooperatives. In each case they have spread ownership and its responsibility broadly among many people and given them a vital stake in our free economy.

All of our membership is deeply concerned about the future uses of atomic energy. The rural electric cooperatives, of course, have a more immediate interest, for atomic energy should and could soon be a major source of power for them.

Our farmer members already have a stake in the use of isotopes and other byproducts of atomic energy in research, prevention of disease, food preservation, and other functions. All of our members

are concerned about the impact on the economy of this tremendous new industry. We would like, for that reason, to spell out what we feel must guide any legislative action of this committee and the Congress.

Whenever an important new scientific discovery is made, mankind must pass through a period of adjustment to it. Sometimes such periods are painful, indeed. Sometimes they involve serious, if not irreparable, loss of social, economic, cultural, political, even religious, values which have been built by the painstaking thought and effort of generations.

It is our task to see that this is not the case with atomic energy. But it will be the case unless the most determined, clear-visioned courageous effort is made by all of us to prevent it. For it is probable that atomic energy represents the most portentous scientific discovery ever made by man.

The impact of the introduction of atomic energy as a source of basic power into our economy can have one of two results, depending on the policies which are pursued:

That impact can cause an acceleration of the already alarming trend toward monopolistic control of our entire economy; it can thus help make a hollow machinery out of the phrase "people's capitalism."

Or it can be the means of restoring some balance between big and little business; it can be the means of strengthening democratic economic institutions built by the people for the people's benefit as cooperatives are; it can be the means of making the term "people's capitalism" really meaningful.

People in less privileged areas of the world cannot hope, within generations, to drive pushbutton cars. They can hope to build small businesses, village industries, organizations of farmers, unions of workers, credit unions and cooperatives of many groups of people. A people's capitalism in America that reveals itself as a pattern of participation by many people in building that sort of economic institution can win the allegiance of millions around the world.

What has all this to do with the impact of atomic energy in our economy?

Atomic energy is still basically the property of all the people as a nation. They have bought and paid for their proprietory right to that basic energy. The fundamental policy that ought to be pursued and which could guard economic freedom against monopoly, perhaps for all time, is a policy like this:

1. The Nation shall lease but never sell the right to develop atomic power to competent agencies, public and private.

2. Where private development or local development proves incapable of bringing about steady and rapid progress, the Government itself will proceed directly with development of "yardstick" installations in high-cost power regions.

3. If public funds are to be spent in building reactors or in other ways, they shall be so spent as to help make power as cheap and abundant as possible in every section of the country and to decentralize control of that power as much as practicable.

4. Both leasing policy and expenditure of public money shall give preference to nonprofit and cooperative agencies because they can and will distribute the power more cheaply, and will give preference to

smaller businesses over larger ones in order to help check the drift toward monopoly and restore economic freedom.

If someone says that we can only make rapid progress by putting development in the hands and outright ownership of our largest corporations and those already dominating our power supply, we would simply disagree. We would say that because it has been the policy thus far of the Atomic Energy Commission to do that very thing is one reason we have not progressed faster. Power companies have big vested interests in their present methods of producing power.

Recently it was proposed before this committee that our Government plan to spend $1 billion a year on atomic energy development.

Why?

Obviously because the huge companies that have billions to spend aren't planning to spend it on a development that can mean a godsend to the Nation as a whole, but which might upset the present patterns of economic control. We are not blaming anyone for this. We are only saying the interests of differing agencies are different from one another.

If the United States is going to spend public money on atomic energy development, it should be so spent that electric cooperatives and other nonprofit agencies have their full share of the work, responsibilities, and benefits, not a few crumbs here and there as at present. If public funds are to be spent, they should undergird renewed economic freedom and healthy competition, and they should not subsidize existing monopolistic control of power.

The recent report of the panel on the Impact of the Peaceful Uses of Atomic Energy, chaired by Robert McKinney, may well reflect the atomic power policies of the Nation. This committee has had extended testimony presented to it on the various recommendations of that panel. We would like, on behalf of the Cooperative League, to make some specific suggestions growing out of the recommendations of the panel.

RECOMMENDATION NO. 1

In order that the United States may regain the initiative in peaceful uses of atomic energy, we believe that the Government should undertake development of an atomic power program. We believe that as long as the Atomic Energy Commission fails to take action pending major investment by industry, the program will be delayed. This is a delay we cannot afford in light of the world's critical situation.

The power industry is quite happy with power production and power rates as they exist today. The pioneering work in the atomic power field must therefore be undertaken by the one agency which can afford the risks of such experimentation. The only such agency is the United States Government.

We recommend, therefore, the adoption of the Gore bill, S. 2725, introduced July 30, 1955. This bill would authorize and direct construction by AEC of six nuclear powerplants for the production of electric power.

RECOMMENDATION NO. 2

The Cooperative League recommends that the Atomic Energy Act be amended as necessary to permit theAEC and other Federal agen-

cies to undertake a real Federal atomic power program. During the debate on the Atomic Energy Act of 1954, the Senate adopted the so-called Johnson amendment, which would have authorized such construction. If the Johnson amendment had been agreed to by the House and AEC had carried forward the intent of the Congress, we could now have real atomic powerplants under construction.

It is a sad commentary that, as Walter Reuther, a member of the McKinney panel, said:

> No private construction of power reactors has begun; no firm contracts have been signed. None of the private proposals has reached the end of the first of five stages which, according to the Director of the AEC Reactor Division, must be completed in order to test the commercial feasibility of full-scale power reactors.

RECOMMENDATION NO. 3

The Atomic Energy Act should be amended to permit rural electric cooperatives and public bodies to obtain preference in the granting of licenses for construction of atomic power plants for research and development purposes.

The co-ops and municipal utilities are now granted preference in the issuance of commercial licenses. For the time being, however, the research and development programs are likely to play a more important role. The nonprofit bodies should not be excluded from preference in that field which would retain the yardstick and prevent the further development of monopoly.

RECOMMENDATION NO. 4

We recommend that the AEC establish a division of civilian power with an advisory committee, including adequate representation for the electric cooperatives and public power systems.

The AEC is directed under the Atomic Energy Act of 1954 to establish such a division; but the steps which have been taken have been inadequate and ineffective. Until such a division is established and the emphasis upon civilian power becomes a major factor in AEC's considerations, the Nation is likely to stumble along in an inadequate civilian program. We believe the McKinney Panel had this in mind when they recommended measures to achieve leadership in the development of civilian atomic power

RECOMMENDATION NO. 5

We recommend that the Atomic Energy Act be amended to provide for compulsory licensing of all atomic patents, not just for limited compulsory licensing of patents declared affected by the public interest.

Actually, the atomic program grew out of a huge public investment in a completely new field. The technology developed belongs to the taxpayers and the people as a whole. We believe it is contrary to the public interest for any corporation or person to be able to get in a position where he may retard the development of an entire new industry and a great new energy resource just because it conflicts with his own personal interests.

The patent feature of the atomic energy program carries more danger than any other single aspect of the program.

RECOMMENDATION NO. 6

We recommend that the Congress direct AEC to speed and facilitate public understanding of the atomic power program. The slowness with which the AEC has declassified atomic power information has been a brake on civilian development. Every effort should be to declassify information as quickly as possible and make it available to the public in such form that big and little business alike may adapt it to their use.

RECOMMENDATION NO. 7

We recommend construction of large experimental reactor-power plants in connection with atomic installations which could accomplish these objectives:

Help meet energy requirements in areas threatened with power shortage;

Replace energy now taken out of the Nation's power economy in atomic production; and

To provide experience which could encourage later investment by the power industry, the cooperatives and others in further reactor powerplant development.

RECOMMENDATION NO. 8

We recommend that the Congress curtail the power of the Office of Defense Mobilization and DEPA to grant accelerated tax amortization certificates for the development of atomic power.

We are convinced that the accelerated tax-amortization program is a significant factor in the development of monopoly and that its use becomes a subsidy to the private profit power companies.

The private power companies in the last 5 years have been granted certificates which will net them almost $1.2 billion in interest-free loans, giving them, therefore, a competitive advantage over cooperative and public power systems.

At present in our country, the big fellows are getting bigger and the little fellows littler, in an economic sense, all the time. Some of the little fellows are ceasing to exist. These are powerful trends whose roots lie deep in our financial structure and methods, in control of research, in technological change, in nationwide television advertising, in some policies of the Government itself.

Unless those trends are reversed, America will cease to be the same America we have known heretofore. It will become instead a country of concentrated power, spoon feeding its population from a few huge mass-production enterprises over which the people have no control whatever and for those operation they have no shred of responsibility.

These trends must be reversed. We believe they can be.

We believe that atomic energy may be a great enough potential force to accomplish that purpose, if right policies are pursued resolutely and with courage. Certainly we should try.

Chairman ANDERSON. Thank you, Mr. Jennings.

The committee has received several additional communications which will be included in the record at this point, together with Mr. Reuther's separate opinion on the panel report referred to earlier.

(The information referred to follows:)

SEPARATE OPINION OF WALTER P. REUTHER ON CERTAIN ASPECTS OF THE REPORT OF THE PANEL ON THE PEACEFUL USES OF ATOMIC ENERGY, TO THE JOINT CONGRESSIONAL COMMITTEE ON ATOMIC ENERGY, JANUARY 25, 1956

I joined the report of the panel because I am in agreement with its general conclusions and recommendations and because I feel it was motivated by a high sense of duty and public interest on the part of the members of the panel. However, I advised the panel that I wished to exercise the usual privilege accorded to members of such advisory groups in submitting on my own behalf a separate statement of views concurring with the report in general but differing in conclusions and emphasis on particular points.

The chairman of the panel, Mr. McKinney, said he interpreted the assignment of the panel as requiring it to report only a consensus of the members' views. Accordingly, he declined to include my statement as a part of the panel's report to your committee.

I therefore had no alternative but to send my separate views to you directly and request that, in accordance with customary procedure in advisory committees of this kind, the committee incorporate them in its records as an integral part of the panel report and include them in any report to Congress or other publication which the committee may make of that report.

The points which I wish to emphasize are as follows:

I. THE CHALLENGE OF WORLD LEADERSHIP

In the cold war, in freedom's struggle against the forces of Communist tyranny, in the struggle for the hearts and minds of men, speed, all possible speed, in harnessing the atom to man's peacetime needs can be decisive.

Access to low-cost nuclear power may prove the key to the economic development of backward areas and make possible the liberation of millions of people from poverty, hunger, ignorance, and disease. America's leadership is essential if we are to block the Communists in their efforts to forge poverty into power.

Our success in harnessing the atom to lift the burden of poverty and disease from hundreds of millions of the world's people living in hunger and ill health would establish America in a position of moral leadership against which Communist propaganda would be impotent.

Harnessing of the atom for peaceful purposes will give us the tools with which to wage freedom's most effective propaganda to these people—the propaganda of the democratic deed. Failure on the part of America to pursue the peaceful harnessing of the atom with maximum speed, determination, and dedication may prove to be the Achilles' heel of the cold war.

II. PEACEFUL ATOM PROGRAM LAGS

We shall not give leadership to other peoples if we refuse to exercise it in our own behalf. The fact is that the United States is failing to demonstrate the outstanding leadership in releasing atomic energy for peaceful purposes which it demonstrated in putting the atom to work for war.

We are not moving with speed and determination to convert atomic energy into an instrument of peaceful progress. Our program for developing atomic energy as a source of electric power is moving much too slowly.

For many years after the war no really significant beginning was made to apply the atom to peaceful uses. Finally, 1 year ago, AEC invited private enterprise to submit proposals for participating in the development of atomic reactors for the generation of electric power. But no private power reactors are now under construction and none has completed the initial stages of design.

The one large-scale reactor now building is the AEC demonstration reactor at Shippingport, Pa. Apart from this Government project, the sobering fact is that, today, 10½ years after the end of the war, America's peacetime atomic power program has not advanced beyond the drawing boards. The head of the AEC Reactor Division states that as of today there is no certainty when, if ever, private industry will build and operate a power reactor.

The British Government recently announced that its first full-scale power reactor will begin to deliver electric current on October 17, 1956. Soviet Russia claims to have a small-scale pilot model delivering electric power now. Japan's

Atomic Energy Commission has been assured by the General Electric Co., according to press reports, that it can build a full-scale power reactor for that country to deliver power within 3 years at a cost competitive with existing power rates in many areas of the United States.

III. NUCLEAR POWER ESSENTIAL TO ECONOMIC GROWTH

The need to develop atomic energy as a practical source of power for use in the United States is urgent. There are power-hungry areas in our country today. There are other areas where the high cost of power retards economic progress and is encouraging the flight of industry to other parts of the country.

Total power requirements in the United States will expand at a tremendous rate over the next 25 years. We shall need nuclear power to meet those requirements. I cannot accept the comfortable assurance that our conventional fuel resources will meet all our power needs for another 20 to 25 years. Nor will I rely upon the Federal Power Commission's consistently conservative forecasts of power requirements as reflecting the true growth potential of our economy or the increasing needs of the American people.

No power ceiling should be imposed upon the normal and necessary expansion of our economy. Of that we must make sure. We must develop every source of energy we have, including atomic energy.

IV. HOW BEST TO GET THE JOB DONE

To meet the challenge and to realize the opportunity of the peaceful uses of atomic energy, we must mobilize all our forces and enlist the active participation of every segment of our economy. We must make full use of the capabilities both of Government and of private enterprise. Only by drawing upon the special contributions of each can we make satisfactory progress toward our objectives—fortifying the strength of our Nation, advancing the welfare of our people and discharging our world responsibilities.

The technological barriers ahead of us are formidable. Enormous investments are required. The financial risks are great. But all these difficulties can be overcome by a united, determined and coordinated effort.

It would be tragic to destroy this great opportunity for national achievement and world leadership by dissipating our strength in ideological warfare over the respective roles of Government and private enterprise. That is a sure-fire formula for standing still here in the United States while the rest of the world moves forward in the practical application of atomic energy to human needs.

The opportunities for Government and privte enterprise to make their special contributions in this new field will arise out of the particular problems encountered at each stage of development. Both will have a vital part to play throughout, but the character and degree of their responsibilities will change as we make progress in mastering the new technology.

The early research and experimental phases of the program are primarily the Government's responsibility, it is generally agreed. The development and construction of small-scale power reactors is also primarily a Government responsibility, according to the panel report.

As to the next stage of the program, I question whether the present AEC policy of placing prime responsibility on private utility companies to provide risk capital for the construction and testing of full-scale demonstration reactors is sound. I share the point of view that the productive know-how and managerial skill of American private enterprise can make an important contribtuion to this phase of development, providing, however, the Government takes the initiative and assumes the financial risks involved in the construction and testing of these full-scale reactors. Building these first full-scale power reactors is an extension of the research and experimental work which only the Government is capable of performing under present circumstances. Accordingly, I suggest that the AEC policy of placing primary reliance on private enterprise at this stage of development be subjected to early review and re-appraisal by the Joint Committee.

V. PROTECTING THE PUBLIC INTEREST FROM MONOPOLY

Once the practical possibilities of atomic energy have been demonstrated, a realistic and attractive opportunity will have been created for private enterprise to engage in the new atomic industries and develop their full potential. When this stage is reached, the Government is obligated to guard against monopoly control in the new industries, and to make sure that consumers are protected

by effective competition in the sale of nuclear power and other atomic services. Both publicly and privately financed electric utility systems should engage in supplying nuclear power to the public just as in the past they have supplied power generated from conventional energy sources.

Further elaboration will be given to each of these five general observations, followed by points I wish to emphasize on the subjects of manpower and training, and hazards and protection.

I. The Challenge of World Leadership

When Senator Clinton P. Anderson appointed the panel on March 26 of last year, he said:

"Other industrialized nations, besides the United States, are pressing to become leaders in the manufacture and sale of atomic power plants for export. Around the winners of this race, underdeveloped, power-hungry nations may group themselves in new satellite orbits, far different from present alliances."

We dare not ignore this challenge. As the strongest of the free nations, America's responsibilities of world leadership require that the achievement of maximum progress in the peaceful uses of atomic energy be dealt with as a matter of highest national priority.

We must help make it possible for the hungry and desperate millions of the world to develop their economic and human resources so that they may win economic security and material well-being without political or spiritual enslavement. Recent Soviet offers of economic assistance to Egypt and Middle East nations, and the increased economic aid promised by Soviet leaders during their recent Asian tour testify to the increasing emphasis that economic penetration will play in Soviet foreign policy in the new phase of the cold war.

Speed may prove to be the very essence of survival. The free world cannot win the cold war except as it succeeds in winning to freedom's side the vast majority of the uncommitted people of the world.

If less than our best effort would result in the Soviet Union's gaining the initiative and capturing the position of leadership in the field of nuclear power, then this potent weapon of economic penetration would be used to further enslave millions of people and could dangerously shift the center of world balance to the jeopardy of the free world. Only with the initiative and leadership securely in the hands of America and the free world can we be certain that nuclear power will be used as an instrument of economic liberation rather than a weapon of political enslavement.

The seriousness of the challenge that we face in maintaining leadership is reflected in a story in the New York Times, dated January 24, 1956, which reported as follows:

"The prospect of Soviet leadership in nuclear energy development by 1960 is causing concern among United States specialists in the field.

"Should present plans be realized, the Soviet Union will have atomic electricity plants with greater capacity than the United States and Britain combined in 1960.

"The new Soviet 5-year plan calls for completion by 1960 of atomic energy plants with total capacity of 2,000,000 to 2,500,000 kilowatts."

I support the report of the panel which recommends that "the United States call a series of regional conferences of bilateral partners for the immediate establishment of realistic goals for the installation of atomic power abroad. And that the United States announce that it is prepared to furnish the nuclear fuel, provide the necessary technical assistance, and permit contracts for the installation of at least 1 million kilowatts of atomic generating capacity outside the United States at as early a date as possible, hopefully by 1960."

The panel then notes: "Such a [foreign] program would parallel and possibly exceed the capacity installed during the same period at home."

While supporting the panel's recommendation that America must lead in providing assistance to friendly nations in the development of nuclear power, I think it is dangerously unrealistic to expect America to achieve and maintain a position of leadership in the world if we are not in a position of leadership at home. American leadership in the world contest must rest upon and be a reflection of a highly developed and advanced nuclear power industry in America. I am at a loss to understand how America can be in a position of technological leadership in building nuclear power plants in underdeveloped countries if we

have not advanced the level of our technology by building a nuclear power industry in America.

As an interim measure the panel proposes that the foreign nuclear power program be carried out by bilateral agreements between the United States and other countries.

I wish to emphasize in addition the special responsibility that devolves upon our Government in the forthcoming conference where 20 nations will make plans to establish a special atomic agency in the United Nations. The United States should take the lead in urging that this U. N. atomic agency provide practical fulfillment of the "atoms for peace" proposal which President Eisenhower made to the world in his appearance before the U. N. Assembly in December 1953. The inspiration and the rallying point which he provided for forging the positive instruments of peace brought new hope into the hearts of men. His bold initiative placed a solemn obligation upon our Nation to do all within its power to fulfill the pledge he made and to justify the hopes which he called forth.

Full participation of the atomic "have-not" nations in the policies and programs of the U. N. agency is imperative and should be provided for. The international atom-bank, which was the core of the President's proposal, should be entrusted to this agency. It should have powers of inspection and control adequate to prevent diversion to military use of the fissionable fuels and by-products thus dedicated to peaceful uses.

II. PEACEFUL ATOM PROGRAM LAGS

I believe that the present state of development of peaceful uses of atomic energy in the United States fails to reflect the urgency which our domestic needs and our responsibilities of world leadership demand. Let's look at the record.

In January 1955, the Atomic Energy Commission asked for proposals by interested parties or groups to participate with it in the development and construction of large-scale nuclear power reactors. Two such proposals are now under negotiation with AEC. Two other proposals to proceed independently were received and are in negotiation with AEC on the issuance of licenses. Two other participation proposals submitted were not accepted by AEC as a basis for negotiation.

On October 10, W. Kenneth Davis, Director of the AEC Reactor Division, publicly stated:

"There is one aspect of this search for development contractors that is most important; we would like to have new contractors get into the business. The expanding program badly needs more contractors."

No private construction of power reactors has begun. No firm construction contracts have been signed. None of the private proposals has reached the end of the first of five stages which, according to the Director of the AEC Reactor Division, must be completed in order to test the commercial feasibility of full-scale power reactors.

Because of the many difficulties to be overcome and the financial risks involved, we are told by this AEC official that there is today no definite assurance how many privately financed full-scale reactor projects will be carried to completion, or whether any of them will.

Thus, while a beginning has been made, progress is lagging. In contrast to our record in the United States, Great Britain has launched an extensive power-reactor program which, within 5 to 10 years will take over a considerable part of the burden of meeting that country's power needs. It has announced that power from its first full-scale reactor will go on the lines October 17 of this year.

There is no question that interest in putting nuclear power to work is lively in Soviet Russia, in western Europe, in Japan, and in other countries. With the same degree of interest and urgency in the United States, our unquestioned superiority in technology and resources could quickly restore our country to the position of leadership which rightfully belongs to us.

The world's first chain reaction of uranium under human control was set off by the United States in December 1942. Two and a half years later we detonated the first atomic bomb. In that short interval, experiment, discovery, plant construction, demonstration, development, production, and practical results followed each other at a pace unparalleled in the history of the world.

This was under the urgency of a world war. The Government mobilized our energies to achieve the goal regardless of cost. We cannot expect development of the peaceful uses of the atom to proceed at that pace. But it cannot be dis-

puted that the little progress which has been made toward peaceful application of the atom in 10½ postwar years is much less than we should have accomplished with the great scientific, technical, and material resources available to us.

III. NUCLEAR POWER ESSENTIAL TO ECONOMIC GROWTH

One reason for the slow start we have made in developing nuclear power appears to be the view held by some that there is no urgent need for a new source of energy in the United States. Another cause of delay can be found in the excessive, overheated and, in my judgment, unwarranted controversy that is given so much attention in official circles today—the issue as to the proper roles of Government and of private enterprise in carrying out projects of national concern. I express my views on this question in sections IV and V, below.

There is unquestionably real and urgent need for the additional power which atomic energy will give us just about as soon as we make up our minds and commit our resources to its development as a commercial source of electricity.

The fact is we could use nuclear power today in many power-hungry and high fuel-cost areas of the United States if the technology of producing it were far enough advanced to bring costs down to the levels that we have every reason to believe possible.

Estimates given to the panel on the declining capital and fuel costs of nuclear power that are to be expected as development progresses suggest that it will become a competitive source of power in many areas. Indeed we can safely assume, I believe, that before too long nuclear power will begin to bring to some areas of the United States the same stimulating effects on business prosperity and employment opportunities that low-cost power has brought to the Tennessee Valley and the Pacific Northwest. I am attaching copies of a working paper which I submitted to the panel on cost estimates of nuclear power in comparison with conventional power costs.

The urgency of our need for nuclear power will intensify as total power requirements of the United States increase. Energy needs of this country have grown rapidly in the past and will grow more rapidly in the future. Sixteen years ago each man-hour of a production worker in manufacturing required 4.6 kilowatt-hours per man-hour. Today the requirement is 7.8 kilowatt-hours per man-hour. Fifteen years from now, according to Electrical World, it will be 14.1 kilowatt-hours. No one today can even begin to estimate how much the automation of production processes may increase the consumption of power per man-hour. Rapidly expanding uses for the light metals, especially in military applications, can create large new demands for power.

Reliable estimates of our future power needs show that in the next 25 years we probably shall have to add 5 times as much new capacity to the Nation's installed generating capacity as the total capacity we have created over the past 50 years. From 115 million kilowatts today we shall need to expand to approximately 600 million by 1980. This is the forecast given to the panel by an industry group brought together to advise on this question.

A second and lower forecast of power requirements is also included in the panel report. This shows a need for only 360 million kilowatts by 1980. The panel concludes that actual requirements probably will fall somewhere between these two widely divergent forecasts.

Whereas the forecast of 600 million kilowatts by 1980 is based on a forecast issued by Electrical World, the lower forecast was made by the Federal Power Commission. The industry group that advised the panel would not accept the FPC forecast as a reliable basis for anticipating our future power requirements and it was supported in this by industry members of the panel's power seminar. The past record proves that the Federal Power Commission's forecasts of power requirements have consistently failed to anticipate the expansion of power consumption that has actually occurred. For example, the Federal Power Commission's estimate for the southeastern area of the United States for 1955 was 57 billion kilowatt-hours while actual power use in this area (excluding AEC consumption) was 110 billion kilowatt-hours, almost double the FPC forecast for 1955 and 32 percent higher than its forecast for 1970. I do not think Federal Power Commission forecasts should be taken into account in appraising our future power needs.

A fivefold increase in power supply in 25 years presents a tremendous challenge. We should enthusiastically welcome the opportunity which the advent of nuclear power gives us to meet that challenge.

The necessary expansion of our dynamic economy must not be restricted or limited by a power deficit. Adequate power resources are essential for the economic growth that is needed to meet the possibility of war and to fulfill the opportunities of peace. The need to prepare today to meet tomorrow's requirements is an urgent and compelling one.

There are two other reasons why the need for nuclear power is urgent. The panel was advised that some informed observers question the capacity of our coal industry to meet competitively the enormous requirements that will be made upon it by the anticipated increase in electric power generation.

The other reason is the tremendous hunger of our economy, both in peacetime pursuits and in military operations, for liquid and gaseous fuels. There is no indication that our dependence on these fuels, especially for motive power, will decline. There is every reason to expect a large increase in demand.

The supply of liquid and gaseous fuels is exhaustible. The ultimate supply of atomic energy would appear to be almost inexhaustible. Every unit of oil or gas that can be replaced by atomic energy in the generation of electricity is, from a national point of view, money in the bank. This will be true of coal also when we decide, as we undoubtedly will, to develop the technology of converting coal into liquid fuels.

IV. HOW BEST TO GET THE JOB DONE

The big task before us is to achieve major technological break-throughs in the construction and operation of full-scale demonstration power reactors, the fabrication of fuel elements and the reprocessing of spent fuels. Only by doing these things on a full-scale basis will we begin to find solutions that will lead ultimately to an efficient atomic power industry. Demonstration power reactors of all the promising types must be built, operated, and put to the test.[1]

The AEC program for getting us through this development phase is to turn the primary responsibility over to electric utility companies, or groups of them, who in turn call upon manufacturers to contribute designs and build the components. While AEC will furnish information, assist in research and development, make nuclear fuel available at low rentals, reprocess spent fuel, and lend considerable financial assistance, it still requires private participants to take the basic risk and gives priority to proposals which impose least financial burden upon the Government.

AEC policy thus seeks to achieve two purposes at once: To promote the development of nuclear power, and to transfer to private enterprise a major part of the initiative and responsibility.

The panel report recognizes that it may not prove possible to achieve these two purposes simultaneously. It recommends that in the event industry does not take on the full risks and burdens which AEC has assigned to it, the AEC should construct a full-scale demonstration reactor of each major type and bring atomic power to a point where it can be used effectively and widely on a competitive basis.

In support of the panel's recommendations, I urge the Joint Committee to institute early inquiry in order to determine how far and how fast private enterprise can and will assume the full risks and burdens of getting us over the hump and on to the high road of practical nuclear power.

I make this supplementary recommendation because so much evidence has come to light that indicates private enterprise cannot reasonably be expected to shoulder so much of the burden in this development phase. Tremendous capital investments and development expenditures are called for. The chance of incurring major losses through unsuccessful design or early obsolescence are considerable.

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[1] W. K. Davis, Director of the AEC Division of Reactor Development, described in a speech on October 10, 1955, the nature of the full-scale development problem:

"The plain fact is that today we do not know how to do many of the things required for economically competitive power in the United States * * *.

"The construction of large prototype, or demonstration, reactor powerplans is a very necessary step for a variety of reasons. For example, many features of power reactors simply do not scale up in a wholly predictable fashion. Therefore, it is necessary to go essentially to full size to get certain technical data. In addition, it is impossible to estimate the cost of components, the cost of construction, or the cost of operating a power reactor with sufficent accuracy without building one. Until some of the steps are actually taken one simply cannot have a reasonable estimate of power costs in the new nuclear field.

"It is also necessary that someone build the first generation of full-scale nuclear powerplants—a generation that will be relatively expensive—so that there will be the cheaper second, third, and following generations. The first prototypes of any power reactors will be expensive. The second will be simpler by virtue of experience gained with the first. Simpler and cheaper manufacturing methods will be learned and the expanding volume will still further reduce costs."

Neither AEC nor the manufacturers of reactors and components can give a utility system entering this field the kind of safety standards, performance guaranties, and other assurances which bankers financing a private venture normally require. AEC will contribute substantial financial and other assistance, but the basic risk remains with the private participants.

The serious shortage of engineers and scientists trained in this field is another barrier to widespread participation of private industry in this development work. I discuss this question in a later section.

Another serious deterring factor with respect to private enterprise carrying the prime responsibility relates to the matter of classified infomation and national security. The panel properly recommended that: "The Commission remove all reactor technology from the restricted data category, including such areas as fuel element fabrication and processing techniques, leaving specific military applications of such technology to be protected insofar as national security is involved, by the defense classification system."

This delicate matter of national security versus free accessibility to secret data is a further factor discouraging private construction of full-scale demonstration reactors in this stage of the program.

The panel accurately reports that "no administrative agency can even give a guaranty that a private citizen has all the information needed for decisions and actions." For example, a private group might use the information available from AEC to plan and build a reactor which already has been made obsolete by new information in reactor technology which the AEC cannot make available because it is in the restricted military category. Under these circumstances only the scientists, engineers, and technicians working on Government projects can have free access to all of the latest data since they are working on both the military and the peacetime phases of the reactor program.

Manufacturers of equipment in this field have shown a great interest and undoubtedly have a vital contribution to make, but their experience and inventive qualities are brought into play only as they are engaged to join in the actual construction of a full-scale demonstration reactor. If the initiative in such construction is left in the hands of the private utilities at this stage of the program, the manufacturers' creative contribution will not be fully realized.

The utility companies are not powerfully motivated to develop new sources of low-cost power. The policies of state regulatory commissions assure them a fair return on their investment whether they expand or not, whether they increase power use through rate reductions or hold it back by keeping rates high. The incentive to them is rather to occupy the nuclear power field in order to hold it against the nonprofit public power systems. This is the motive ascribed to them by a dispatch to the Wall Street Journal from the Atoms for Peace Conference at Geneva, August 11, 1955:

"Officials of the companies which make reactors say frankly that most of their utility company customers have no early expectation of cutting costs by building atom plants; their primary motive is to stake this out as an area of private rather than public power."

The attempt by AEC to transfer prime responsibility to private enterprise at this time appears to be premature. If, as a result, we continue to encounter serious delay in nuclear power development, we shall be guilty of pursuing a doctrinaire free-enterprise approach to a problem which, at least for the present, is essentially national in purpose and scope and involves risks and losses of a magnitude which only Government can reasonably be expected to incur.

The development of large-scale reactors is, essentially, an experimental operation—as fully experimental as the construction of the small research reactors for which AEC is assuming the full responsibility and cost. If it is economically sound and proper for the Government to bear the burden of primary research in building the small experimental reactors, it would appear to be equally sound and proper for the Government to carry the major responsibility and risk in the second phase of experimentation—the building of full-scale demonstration reactors.

This view of the problem is confirmed by the views expressed by Gordon Dean, former Chairman of AEC, in his book "Report of the Atom", published in the fall of 1953:

"To help create the technological clime needed for further rapid progress, it is quite evident to me that the Government, through the Atomic Energy Commission, must continue to play a significant and leading role in reactor development, not only for military purposes, but for general power purposes, as well."

"In close association with industrial groups, whether public or private, the Commission must, therefore, design and build and operate the forerunners of the large reactors which will some day feed appreciable quantities of electricity into the utility networks of the country."

Further indication that the Government is better equipped than private enterprise to advance the development program can be found in the speed with which the AEC demonstration reactor at Shippingport, Pa., is being built, in contrast to the slow progress of private projects. Admiral Hyman Rickover, who built the reactor for the *Nautilus*, and is in charge at Shippingport for AEC, made this statement last December about that project:

"We started constructing this plant in May of this year [1955]. We expect to have it done in 1957. So you see that we are designing, developing, manufacturing, constructing, and building an atomic powerplant in generally less time than it takes to build a conventional powerplant."

We do the utility companies no service by asking them to accept burdens which in view of all the unknowns in the present state of atomic technology they cannot finance as sound or normal business ventures. We do them no disservice when we ask the Government to recognize the national importance and scope of the task at hand, to carry the basic risk of this full-scale reactor development, while affording the designing and manufacturing segments of private enterprise full opportunity to make their valuable contributions to the program.

The ingredients of the present situation do not add up to a formula for progress. If we want useful civilian atomic energy as soon as we can get it, both for domestic use and for international purposes, something must be done, starting immediately, to solve and overcome the many important technological problems that stand in the way.

Only bold initiative by Government can accelerate needed progress and get full-scale reactors in operation so that the timelag between theory and practice can be minimized. Only when the Government has completed both phases of this basic research work of completing and getting into operation both the model reactors and the full-scale demonstration reactors, can we expect to get the influx of private risk capital and the resulting full impact of the dynamic qualities of individual initiative essential to carry the program to higher levels of development.

I hope that the ideological barrier will not be raised against my recommendation that the Joint Committee examine AEC development policy with a view to putting AEC to work building demonstration reactors, as the 1954 act already authorizes it to do.

Neither Government nor industry can do this job alone. It was the blending of the special contributions of each that provided the genius which gave America the atomic know-how to produce the first bomb. At this stage of our national atomic effort, nothing could be more tragic than to split our forces by engaging in a sterile and senseless fighting of ideological windmills. Our free-enterprise system is not being challenged in America. If it were, less than 1 percent of the American people would support such a challenge, for the American people understand clearly that our free economy motivated by individual initiative and enterprise has given them a higher standard of living than any other people enjoy. We must approach this problem free from preconceived prejudices or fixed theoretical or ideological positions. We need to make judgments on a sane and sensible basis as to how best we can, as a free nation and a free people, get the job done.

V. PROTECTING THE PUBLIC INTEREST FROM MONOPOLY

As the operation and testing of full-scale demonstration reactors begins to show how nuclear power can be produced on a commercially competitive basis, realistic and valuable business opportunities will arise.

Electric utility systems, both private and public, will then find it feasible to finance their investments in the generation and distribution of nuclear power as new capacity is required to serve areas where such power can be supplied at lower cost. This will create an expanding market for the manufacturers of reactors, fuel elements, and other components, and for others who equip themselves to perform the various service operations required by the new industry, such as fuel element fabrication and the reprocessing of spent fuels.

At this stage of development the declaration of Congress in section 1 of the 1954 act deserves emphasis; namely, that it is the policy of the United States

that "the development, use and control of atomic energy shall be directed so as to * * * strengthen free competition in private enterprise."

To make sure that this purpose is carried out, the attention of the Joint Committee should, in my opinion, be directed to three considerations that bear directly upon it.

One is the policy with respect to patents. Both to prevent monopoly and to encourage progress the Joint Committee should give consideration to a simpler and more expeditious procedure than section 153 of the act now provides for the cross-licensing of all essential patents, so that the application of past discoveries and the stimulation of new ones will invigorate the atomic industry in the same way it has invigorated the automobile and radio industries. Atomic energy is a basic resource of the American people, developed for them at their expense by their Government, and it must be put to the widest possible use in advancing the public interest.

The antimonopoly provisions of the 1954 act also deserve the consideration of the Joint Committee. Section 105 of the 1954 act permits AEC to use revocation of license as an antimonopoly procedure only after adjudication of the facts in an antitrust proceeding. Thus this remedy is available only if court action is instituted and only when such action has been successfully concluded. This is taking action after the damage is done, usually long after, and it is likely to prove ineffective because of the delay. I suggest that the Joint Committee give consideration to amending the 1954 act so as to give AEC authority to take action when the danger is clear and such action is necessary, to prevent by revocation of license the consummation of monopoly control.

The third consideration I call to the attention of the Joint Committee in connection with this congressional declaration for free competition is the necessity for making competition possible in the sale of nuclear power.

Electric utility companies are not competitive enterprise. They are, and must be, local monopolies, franchised by State authority to serve defined areas and protected from competition within those areas. Their rates are set by State authority at levels calculated to provide a return on investment sufficient to attract the capital required to continue to serve the needs of their customers.

Long experience with electric power rates in the United States has demonstrated that the only effective competition which brings lower rates to consumers is the competitive yardstick that is applied by public power projects. The power policy of the United States Government, and of State governments, has long recognized the right of the people to develop their power resources for their own benefit, acting through their Federal, State, or local governments.

Experience has also demonstrated that the competitive rates of public power can stimulate greater consumption of electricity, speed up industrial progress, increase job opportunities, and raise the living standards of workers, farmers, and all consumers. It has also been demonstrated that electric utilities which, because of this competitive yardstick, sell power on a low-rate, high-use basis find their own prosperity advancing along with that of the communities they serve, thus demonstrating the truth of the principle that there can be more prosperity in sharing abundance than in dividing scarcity.

No exceptional and artificial barriers should be erected against nuclear power. It should be permitted like any other power, where the people so elect, to fulfill its promise of bringing lower costs to areas where power rates are high. The estimates of future nuclear power costs given to the panel indicated roughly that nuclear power publicly produced could speed up by some 10 years the relief from high power costs which nuclear power may be expected to bring. (See the attached working paper on projected power costs.)

The 1954 act permits only limited application of the national power policy to the field of nuclear power. It does not allow AEC to engage in the production or distribution of nuclear power for commercial use. This erects an exceptional and artificial barrier against nuclear power. If it stands, the full benefits of this new source of power will be denied to industry, workers, farmers, and consumers generally.

I suggest that the Joint Committee give consideration to amendment of the 1954 act to bring it into harmony with national power policy by authorizing AEC directly, or through a specially designated agency or division, to produce nuclear power for its own use, and to transmit, or arrange for the transmission of, such power to load centers, and to give nonprofit electric systems first call upon such power for sale to consumers at lowest possible rates.

MANPOWER TRAINING AND EDUCATION

The acute shortage of highly trained scientific, engineering, and specialized technical personnel is the most serious limiting factor in every phase of the program of applying the atom to peacetime uses. This is not a short-run problem. Failure to take effective and adequate steps now to make both a qualitative and quantitative solution will put in serious jeopardy our domestic economic growth and progress and will strip us of the ability to meet the responsibilities of world leadership.

Admiral Strauss, Chairman of the AEC, recently stated that America's colleges and universities are providing less than half of the people required in the fields of science and engineering in all classifications and that we are training less than one-third of the scientists and engineers needed in the field of atomic energy.

I believe that insufficient attention and urgency has and is being given this problem of assuring an expansion of our highly trained manpower base. The AEC program is being seriously delayed because it cannot get needed scientists, engineers, and technical personnel. Private industry by the attraction of high salaries is robbing the AEC of key scientific and engineering personnel and is depleting our already inadequate faculties of colleges and universities. The practice of robbing Peter to pay Paul has already inflicted an inestimable price in delaying our progress in harnessing the atom to man's peaceful needs. Only a realistic approach to our problem of training and education through expanded facilities, larger and adequately paid faculties, stepped-up scholarship programs, better apprenticeship courses, and other such measures can overcome this serious and costly manpower deficit. It must be recognized that the tax structure of both State and local governments and the financial problems of private schools make substantial Federal aid to education essential if we are to remove the roadblocks and make our school system adequate to the challenge and equal to our needs.

I am confident that, as a free people, we can find a formula to provide Federal aid to education without Federal control. We need to reduce the size of our classes and to give greater attention to gifted students. We need to give greater attention to the curriculum of our secondary schools for they form the basis on which our higher schools of education build. Speaking in Cleveland in December 1955, Admiral Strauss stated: "Our atomic progress will be determined primarily by the numbers of young people who study science and mathematics in our high schools and go on to college to become scientists and engineers."

We are losing precious and irreplaceable time for every year we fail to provide educational opportunities to facilitate to the fullest the growth and development of our youth. This loss cannot be recaptured. It is an asset gone forever.

The extension of human knowledge and the training of adequate numbers of competent scientists, engineers, and technicians can be decisive in freedom's struggle against the immoral forces of Communist tyranny. The seriousness of our national educational deficit is reflected in the fact that in 1955 American universities and colleges graduated 27,000 engineers and scientists, while it is reported that the Soviet Union graduated 34,000 students in these fields. A reliable educator reports that the Soviet Union has approximately three times as many students in the fields of engineering and physical sciences enrolled in their higher schools of learning than does the United States and that the Soviet Union is doing a comparably qualitative job of training.

If these reports are true, this is a frightening and dangerous situation, for the struggle between freedom and tyranny is both real and for keeps. It is already clear that the Soviet Union is prepared to send scientific and technical personnel to foreign countries for purposes of economic penetration and subversion in greater numbers than we can afford for our program of economic aid and liberation from poverty.

Dr. James R. Killiam, Jr., president of the Massachusetts Institute of Technology, as reported in the New York Times, January 24, 1956, recognized that Russia has outstripped the United States in the output of scientists and engineers. The New York Times reported that Dr. Killiam urged the Government to draw a master plan for maintaining the Nation's technological lead in the face of swift Russian gains. Dr. Killiam proposed a scientic commission for giving direction and velocity to our technological advance. He stated that the safety of the free world depended "increasingly on that combination of science,

engineering, and industry which we call technology." Dr. Killiam further noted Russia's long-range planning, her short lead time from idea to finished production, the percentage and monetary awards accorded her scientists, and her budget for her technological projects.

The shortage of highly trained scientific and technical personnel will continue to be the most serious retarding and limiting factor both in our domestic progress and in our ability to effectively carry out our responsibility of world leadership. Here again bold and imaginative action is needed by the Federal Government in cooperation with State and local governments in the field of education.

As a practical step in overcoming our educational deficit and manpower shortage, I would like to suggest that Congress give consideration to the creation of a broad and comprehensive system of Federal scholarships to be awarded to students on a competitive basis. Such scholarships would be granted on condition that, upon the completion of their education and training, students would be obligated to serve wherever their training and skill were most needed. If their services were needed to help overcome the teacher shortage or the manpower needs of AEC's military or peacetime atomic programs, they would be obligated to serve wherever assigned for a period of 1 year greater than, and in lieu of, the period of their normal military service. If their services were needed in the implementation of our foreign aid program, they could be assigned anywhere abroad for a period equal to, and in lieu of, the period of normal military service. Such a scholarship program would expand our trained manpower base and would enable tens of thousands of young Americans to develop the capabilities to more effectively serve their country and the cause of human freedom.

I believe that such a scholarship program would inspire thousands of our young people with a sense of democratic idealism and devotion and would afford them an opportunity to make a positive contribution in freedom's peaceful struggle against the forces of Communist tyranny. Such a program would enlist thousands of America's youth as technical missionaries in the struggle against man's ancient enemies—poverty, hunger, ignorance, and disease—and would strip the Communists of the opportunity of forging human desperation and poverty into power.

In the struggle for the hearts and minds of millions of yet uncommitted people in the economically underdeveloped portions of the world, the more young Americans we send to help as technical missionaries with slide rule, with textbook, and with medical kit to work in the pursuit of peace, the fewer we might need to send with guns and flamethrowers to resist Communist aggression in the battlefields.

HEALTH AND INHERITANCE HAZARDS OF RADIATION

Workers in atomic energy installations exposed to ionizing radiations far above levels normally received from the natural environment must be protected by the adoption of Federal standards fixing safe maximum limits of exposure, both on a short-time and cumulative basis, requiring full use of protective devices, and constant use of recording devices to accumulate the record of each worker's exposure, with the facts of that record available to the worker as a matter of right.

Compliance with these Federal standards should be made a condition of AEC licenses for the use of nuclear materials, with revocation of license available as a penalty for noncompliance.

Justification for high safety standards and their strict enforcement in this field derives from the unusual nature of the hazards incurred by workers exposed to radiation over a period of years. In addition to the more easily identified injuries resulting from brief exposure to severe radiation, the injury that can result from moderate overexposure continued for many years may not become apparent until long after the damage has been done.

Experts in the field state that shortening of life by a period of years may result; the victims will die of the usual causes that other people die of but they will die earlier.

Other experts report that genetic mutations adversely affecting the offspring of overexposed individuals may transmit undesirable human characteristics through many generations.

These are, or certainly should be, matters of grave concern for a nation that is about to enter into the age of the peaceful use of the atom in a large way. They should not cause hysteria. They do not require us to discard the atom as a too hazardous instrument for employment in industry, medical therapy or research. But they do compel us to ascertain just as quickly and as surely as we can what the real hazards are, and, from the beginning, to exercise an excess of precaution until more is known about the hazards and how to guard against them.

This much is known already that justifies great concern about the course we are now following. We know, in the first place, that the National Committee on Radiation Protection, acting under the auspices of the United States Department of Commerce, recommends maximum permissible exposure of 300 milliroentgens per week for persons under 45 years of age, 600 milliroentgens for persons over 45. We know, in the second place, that the AEC has adopted a much more exacting standard than 300 milliroentgens per week for the protection of workers in its atomic installations. It has been publicly stated, for example, that the average exposure of all Hanford and Oak Ridge workers in 1949 was held down to 4 milliroentgens per week, as contrasted with the 300 figure permitted by the Department of Commerce. Weekly average exposure of the 10 most highly exposed workers at Oak Ridge in 1949 was only 80 milliroentgens per week.

G. Hoyt Whipple, who was invited to discuss this subject at the Nuclear Engineering and Science Congress in December 1955, asserted that workers subjected for a working life of 30 years to the maximum permissible exposure promulgated by the Department of Commerce would incur the risk of having their lives shortened, on the average, by 3 years. This, according to Whipple, is almost double the reduction of life span due to cancer that 30-year old males can anticipate, and more than 3 times the average number of years that will be subtracted from their lives by accidents of all kinds.

If every individual in a generation, Whipple's figures indicate, were subjected to an exposure of 65 to 130 milliroentgens per week over a working life of 30 years, the mutation burden of the next generation would be twice that which would normally occur.

Whipple recommended that the Government standard promulgated by the Department of Commerce be reduced from 300 milliroentgens to 30 milliroentgens per week.

I do not doubt that almost any statement made today concerning the life-shortening and mutation effects of ionizing radiations can, and probably will, be disputed. I have recited the above statements that have come to my attention not by way of proof, but to give my reasons for believing that the protection of workers in atomic industries must be given immediate and exhaustive study by unions, by Congress, by the Government agencies concerned, and by industries which expose workers to atomic radiations. I hope that the Joint Committee on Atomic Energy will take the initiative, through hearings of its own or by other means, to ascertain the facts so that adequate standards to safeguard workers will be established and to remove unfounded fears that might impede progress.

How Soon Will Nuclear Power Become Competitive?

An analysis of the Prentice report and an evaluation based upon the Charpie report and statements of Lewis L. Strauss and W. Kenneth Davis—a working paper submitted to the panel on the impact of the peaceful uses of atomic energy by Walter P. Reuther, December 1955.

The panel has been given a report entitled "A Forecast of the Growth of Nuclear Fueled Electric Generating Capacity," prepared under the direction of B. R. Prentice, General Electric Co. It estimates for both nuclear power and conventional steam power future capital costs, fuel costs and operation and maintenance costs. Only privately owned plants are considered in this report.

With these estimates and the Electrical World forecast of total capacity, the report develops a forecast of future electric generating capacity, nuclear and total, as follows:[1]

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[1] It also presents forecasts based upon the Federal Power Commission's much lower estimate of future generating capacity, but the report states that the panel which prepared it believes the higher forecast, as shown in table I, is more reliable.

Table I

[Million kilowatts]

	New capacity in year shown			Total installed capacity		
	Nuclear	Total	Percent nuclear	Nuclear	Total	Percent nuclear
1960	0.8	12.8	6	0.8	166.9	½
1965	.9	14.8	6	4.0	232.0	2
1970	2.5	19.9	12½	12.3	320.0	3½
1975	11.0	26.8	41	48.0	438.4	11
1980	22.6	36.7	62	137.8	600.7	23

As noted above, these estimates are made on the assumption that all nuclear power will be installed and operated by private power systems and the costs are calculated on that basis.

(NOTE.—In common with other materials supplied to the panel, the Prentice report omits any reference to the construction of full-scale power reactors by AEC or the construction and operation of nuclear powerplants by other Government agencies. Both of these possibilities are provided for by the Atomic Energy Act. While that act falls short of fully reflecting in the atomic energy field the Federal power policy of many years standing, it did not wholly close the field to Government operations.)

From the basic data in the Prentice report we have derived comparable estimates of future costs of nuclear power in both privately and publicly financed plants. Our computations indicate that public nuclear power can become competitive with conventional steam power about 10 years earlier than will be the case with private nuclear power.

Earliest nuclear power invasion of the conventional power market served by privately owned steam plants will occur in those areas where the fuel costs of conventional powerplants are high.

The Prentice report estimates that fuel costs of conventional plants in the period 1960–80 will vary roughly by 1½ mills per kilowatt-hour between the highest and lowest fuel cost areas of new powerplant construction. While this spread between high and low fuel-cost areas will contract (from 1.6 mills in 1960 to 1.2 mills in 1980), the report anticipates little change in the general level of fuel costs of conventional plants over this period. An estimated reduction of about 10 percent in net plant heat rate (British thermal units consumed per kilowatt-hour of electricity generated) will be just about offiset by increased costs of fuel. No reduction in capital cost of these plants is anticipated. Operation and maintenance costs are estimated to drop only one-fourth of a mill per kilowatt-hour in the 20 years. Total conventional power costs, therefore, will remain fairly constant.

Cost of nuclear power, on the other hand, is expected to be reduced by more than 40 percent from 1960 to 1980. More than half of the reduction will come from reduced fuel costs, and most of the remainder from declining capital costs.

As the cost of nuclear power declines, it will become competitive with conventional power costs first in those areas where conventional fuel costs are high, and as further reductions are achieved it will invade more and more, and finally all, of the conventional power market.

Nuclear power costs are estimated by the Prentice report on both an "optimistic" (low) and "pessimistic" (high) basis. Our computations of public nuclear power costs similarly range from low to high estimates.[2]

Invasion of the conventional steam market served by private plants will begin when the low or "optimistic" nuclear costs become competitive in the high fuel-cost areas. This is shown in table II.

[2] The basic Prentice data and our method of computing total costs of conventional steam, private nuclear, and public nuclear power are detailed in the attached appendix.

Table II

[Mills per kilowatt-hour]

	1960	1965	1970	1975	1980
Private conventional steam plants in high-cost areas	7.5	7.5	7.3	7.1	7.0
Nuclear, low estimates:					
Private plants	8.4	6.8	6.1	5.4	4.9
Public plants	7.2	5.6	5.1	4.4	4.1
Nuclear cost less than conventional steam cost:					
Private plants	(+)	.7	1.2	1.7	2.1
Public plants	.3	1.9	2.2	2.7	2.9

How soon nuclear power may become competitive with conventional power in low-cost as well as high-cost conventional power areas is shown in table III.

Table III

[Mills per kilowatt-hour]

	1960	1965	1970	1975	1980
Private conventional steam plants in low-cost areas	5.9	6.0	5.9	5.8	5.8
Nuclear, low estimates:					
Private plants	8.4	6.8	6.1	5.4	4.9
Public plants	7.2	5.6	5.1	4.4	4.1
Nuclear cost less than conventional steam cost:					
Private plants	(+)	(+)	(+)	.4	.9
Public plants	(+)	.4	.8	1.4	1.7

Both table II and table III show nuclear power from public plants reaching a competitive position relative to conventional power in 1965 and 1970 that is not reached by private nuclear power until 1975 and 1980, respectively.[3]

The above tables assume that the low or "optimistic" estimates of nuclear power cost will prove right. If however the "pessimistic" estimates are borne out, the invasion of the market by nuclear power will, of course, be delayed. The delay will be roughly 10 years, but public nuclear power still will become competitive earlier than private nuclear power, apparently by somewhat less than 10 years. The comparisons for both low-cost and high-cost conventional steam power areas are shown in table IV.

Table IV

[Mills per kilowatt-hour]

	1960	1965	1970	1975	1980
Private conventional plants in high-cost areas	7.5	7.5	7.3	7.1	7.0
Private conventional steam plants in low-cost areas	5.9	6.0	5.9	5.8	5.8
Nuclear power, high estimates:					
Private plants	10.1	8.9	7.6	6.5	5.9
Public plants	8.7	7.6	6.4	5.4	4.9
Nuclear cost less than high-cost conventional power:					
Private plants	(+)	(+)	(+)	.6	1.1
Public plants	(+)	(+)	.9	1.7	2.1
Nuclear cost less than low-cost conventional power:					
Private plants	(+)	(+)	(+)	(+)	(+)
Public plants	(+)	(+)	(+)	.4	.9

The data in these three tables indicate that nuclear power may begin to be competitive by 1970 if produced by private plants, and prior to 1965 if produced by public plants (table II). It may become competitive for all conventional

[3] The Prentice report compares cost of private steam plants and nuclear plants on a basis more favorable to the former than we have done. It figures the costs of both at 50-percent load factor (p. 26). We compute stem plants at 43-percent load factor and nuclear plants at 50 percent, because at p. 24 the Prentice report says this will be the lifetime experience. Had we used 50-percent load factor for the steam plants, the power cost would have been 0.5 mill less, and the differential in favor of nuclear plants would have been 0.5 mill less, than shown in these tables. But see the footnote on p. 5.

power areas some 10 years later, by 1980 in the case of private plants and by 1970 or soon thereafter for public plants (table III). This is on the assumption that the low estimate of nuclear power cost is borne out. If not, nuclear power may not begin to become competitive until 1970 in public plants and until 1980 in private plants, and will not compete generally until 1980 or later.[4]

The possibility that public nuclear plants can reach competitive status 10 years earlier than private nuclear plants bears directly on how rapidly nuclear power capacity might develop and how much of the total power market it migh occupy. The estimates on these points in the Prentice report (table I above) can be advanced, depending on the extent to which the generation of nuclear power is undertaken by publicly financed plants.

Accelerating by 10 years the proportion of new capacity that will be nuclear according to the Prentice report (column 3 of table I), and assuming that the percentages for 1975 and 1980 will be 75 and 85, respectively (based on freehand extension of the forecast curve in fig. 7 of the Prentice report), the following comparison of an all-private and all-public nuclear program provides a rough benchmark for appraising the possibilities.

Table V

[Million kilowatts]

	New nuclear capacity in year shown		Installed nuclear capacity			
	If all private	If all public	If all private	Percent of total	If all public	Percent of total
1960	0.8	0.8	0.8	0.5	0.8	0.5
1965	.9	6.0	4.0	2.0	17.8	7.5
1970	2.5	12.3	12.3	3.5	64.5	20.0
1975	11.0	20.0	48.0	11.0	145.2	33.0
1980	22.6	31.2	137.8	23.0	281.7	47.0

There is no likelihood that all nuclear power will be publicly financed, but these data derived from the Prentice report, broad approximations as they must be at this stage of nuclear development, make clear beyond question that authorization of some degree of public development of nuclear power will both hasten the day when it becomes competitive and increases the areas over which it can begin to bring relief from high rates charged for electric power. This is of critical importance to New England, for example, and could be of very considerable importance to other areas which are far from low-cost public power sources and have been denied the spur which yardstick competition applies to the economic improvement of industry, farms, and homes.

All of the foregoing is, as stated, based on the data and forecasts of the Prentice report. How are the Prentice report estimates to be evaluated?

They are distinctively less optimistic than was W. Kenneth Davis, Director of the AEC Division of Reactor Development, in his speech to the American power conference, April 1955. There he recalled his earlier prediction that nuclear power would account for the following proportions of total new capacity in the years shown (with Prentice report forecasts shown for comparison):

	Percent
Davis:	
1962	10
1972	60–70
After 1972	Saturation
Prentice:	
1960	6
1970	12½
1975	41
1980	62

[4] The Prentice report appears to be conservative in this respect, as will be shown below. Moreover, our calculation of fixed charges in publicly owned plants is perhaps too high. It allows 2.2 percent of plant cost for payments in lieu of State and local taxes, whereas the Federal Power Commission allows only 0.1 percent for this purpose. It allows 0.2 mill more for operation and maintenance costs than on private plants, although the Charpie report, discussed below, says they should be no greater. These 2 factors add approximately 1 mill to the low estimates and 1.2 mills to the higher estimates for public nuclear plants.

Total installed nuclear capacity was forecast by Davis as follows, again with Prentice forecasts for comparison:

[Million kilowatts]

	Davis	Prentice
1960	2	0.8
1965	5	4.0
1970	20	12.3
1975	83	48.0
1980	175	137.8

AEC Chairman Lewis Strauss recently stated the opinion that the Davis forecast is too conservative.

The Prentice estimates appear definitely less optimistic again when compared with the Charpie report to the panel, the Technology and Economics of Nuclear Power, Oak Ridge National Laboratory. He has examined the Prentice report and, while he does not specifically evaluate its conclusions, he says:

"In such a large new technical area which is virtually unexplored it is clear to the writer that all of the cost estimates based on current technology must be pessimistic because we are much more adept at anticipating troubles which turn out not to be serious than we are in overlooking serious problems which later rear their ugly heads."

Charpie looks forward to lower fuel costs than the Prentice report, which estimates nuclear fuel costs of from 3 to 3.8 mills per kilowatt-hour in 1960, 1.6 to 3 mills in 1965, declining further to 1 to 1.5 mills by 1980. Charpie says:

"Nuclear reactor stations are more like a hydroelectric station in the long run in that they will produce eventually zero cost fuel. It is clear that if this reactor is a breeder which breeds by a sufficiently large margin, the value of the additional fuel produced will offset the chemical recycling costs. Thus the net fuel cost is zero."

"The nonregenerative reactors exhibit a fuel cost slightly in excess of 1 mill per kilowatt hour for the optimistic cases. The breeding reactors, whether they are fast reactors or homogeneous thermal reactors, yield roughly zero full cost for reasonable unit reprocessing charges."

When zero fuel cost is achieved for nuclear power reactors, as Charpie anticipates it will be, such plants will be assured virtually continuous operation as base load stations throughout their life. This could mean very cheap power. Adjusting our computations to zero fuel cost and fixed charges computed at 80 percent load factor, nuclear plants could offer formidable competition to conventional steam power, as follows:

Table VI

[Mills per kilowatt-hour]

	1965	1970	1975	1980
Nuclear power, private plants [1]	3.2-3.7	3.0-3.4	2.6-2.9	2.3-2.5
Nuclear power, public plants [1]	2.5-2.8	2.3-2.6	2.0-2.3	1.9-2.1
Nuclear power (high estimates) less than conventional steam power in low-cost-fuel areas:				
Private plants	2.3	2.5	2.9	3.3
Public plants	3.2	3.3	3.5	3.7

[1] See concluding section of the appendix for further adjustment of these nuclear power costs making allowance for the other factors noted in the footnote on page 5 above.

Whereas the Prentice report estimates operation and maintenance costs for nuclear plants 50 percent higher than for conventional steam plants (a differential of 0.3 mills per kilowatt-hour at 50 percent load factor), Charpie says:

"There is no reason why reactor stations should have any higher operating costs after we have obtained some experience with them than do thermal stations."

The Prentice data add up to a total cost of 8½ to 10 mills per kilowatt-hour for private nuclear plants in 1960, declining to 5 to 6 mills by 1980. Charpie says (also speaking of private plants):

"The problem of 4-mill power reduces to one of constructing homogeneous breeders at a capital cost of approximately $200 per kilowatt, or fast breeders for approximately $225 to $250 per kilowatt."

Charpie emphasizes here the importance of reactor design as the key to achieving low (eventually zero) fuel costs and cheap nuclear power. His plant-cost goal of $200 to $250 per kilowatt compares with the Prentice report's estimates of nuclear plant costs ranging from $194 to $228 per kilowatt in 1965 and $176 to $205 in 1970.

Achieving and surpassing Charpie's plant-cost goal can be done only by building, operating and testing full-size nuclear power reactors. (Kenneth Davis stressed this point in his address of October 10, 1955.) To do this within a reasonable period of time calls for an immediate start on full-scale construction of all the promising types of reactors, running the risk, to be sure, of failure in some cases, but learning the lessons and finding the answers quickly is the only way this can be done. The same is true of fabrication of nuclear fuel units and the reprocessing of spent fuel.

That it will be done within a reasonable period under present AEC policy seems unlikely. AEC leaves the initiative largely to a few (too few, Davis says) private-capital combines which for various reasons are hesitant to invest the experimental funds on the large scale that the job calls for. One of the reasons undoubtedly is that they are in no hurry to render their present plants obsolete. Reporting from the Geneva Atomic Conference on August 22, 1955, the Wall Street Journal said:

"Officials of the companies which make reactors say frankly that most of their utility company customers have no early expectation of cutting costs by building atom plants; their primary motive is to stake this out as an area of private rather than public power."

Can the United States afford to be held back in the practical development of atomic power to serve the purposes of those whose investments in conventional power plants might thereby be jeopardized? Russia and Great Britain are pressing ahead vigorously. The nuclear industry committee of the Investment Bankers Association reported to its recent convention the opinion that Western Germany has every reason to move rapidly in this field and by 1965 may have an investment in commercial reactors "equal to that of the United States and the United Kingdom." Furthermore, the President's Materials Policy Commission, a few years ago, pointed out that while our conventional fuel resources are enormous, the day is not far distant when we may be facing increased costs in producing the abundance of fuel which our power-hungry economy will require.

The authority vested in AEC by sections 31 and 32 of the Atomic Energy Act of 1954 to obtain and expend public funds for the construction of full-scale power reactors of all likely types may hold the answer to the question of how rapidly the United States will proceed to do its part in releasing the energy of the atom to serve the needs of our people and the people of the world.

Appendix

Computation of Costs of Electrical Energy in Conventional Steam Plants and in Nuclear Plants, 1960 to 1980

The basic data for these computations were taken from the report furnished to the panel under the title "A Forecast of the Growth of Nuclear Fueled Electricity Generating Capacity," prepared by B. R. Prentice, General Electric; John Landis, Babcock and Wilcox; Roger Coe, New England Electric Systems; W. Dee Shepherd and W. B. Stewart, Westinghouse; W. Kenneth Davis, Director of AEC Division of Reactor Development; and James A. Lane, Director, Experimental Engineering Division, Oak Ridge National Laboratory.

The data for conventional steam plants are: Cost of new plants ($/kw.); range of fuel costs; net plant heat rate; operation and maintenance costs.

For nuclear plants the data are: Optimistic and pessimistic plant costs ($/kw.); optimistic and pessimistic fuel costs; operation and maintenance costs.

The report does not bring its estimates on these cost factors together into estimates of total cost of either conventional steam or nuclear power. Nor does it consider the lower fixed charges that can be achieved by publicly owned plants.

The data and methods used in our computations follow. Page references are to the above report (revision dated October 21, 1955).

FIXED CHARGES

Plant cost

For conventional steam plants the cost is $140 per kilowatt throughout the period (page 14).

For nuclear plants, both private and public, the high and low estimates of plant cost were read from figure 1 of the report (page 8) as follows:

[Dollars per kilowatt]

	1960	1965	1970	1975	1980
Nuclear plant cost:					
High	240	228	205	180	165
Low	200	194	176	155	144

Fixed charges per kilowatt-hour

In the belief that a choice between conventional and steam power would be based upon estimated costs of power over the life of the plant and also on a first-year basis, fixed charges were computed in both ways.

(*1*) *Lifetime basis.*—Depreciation is on a 35-year straight-line basis, averaged for the life of the property.

Plant factors used are in accord with the expectations stated on page 24 of the report—43 percent lifetime load factor for steam plants, 50 percent for nuclear plants.

Rates of return are as recommended by the Federal Power Commission in its staff memorandum for the evaluation of private and public plant costs. Insurance and tax rates are from the same source, except that a higher insurance rate was adopted for nuclear plants, and payments in lieu of State and local taxes by public plants were included at the higher figures applicable to private plants.

Plant costs per kilowatt-year were computed by applying the following percentages to the above plant-cost figures:

	Private steam	Private nuclear	Public nuclear
Return on capital	5.5	5.5	2.5
Depreciation	2.9	2.9	2.9
Insurance	.3	.5	.5
State and local taxes	2.2	2.2	2.2
Federal income tax	2.3	2.3	
Total	13.2	13.4	8.1
Less one-half of return on capital and Federal income tax	−3.9	−3.9	−1.25
Total	9.3	9.5	6.85

The fixed charges so computed, with low and high estimates for nuclear plants, are as follows:

[Mills per kilowatt-hour]

	Private steam	Private nuclear	Public nuclear
1960	3.5	4.3–5.2	3.1–3.8
1965	3.5	4.2–4.9	3.0–3.6
1970	3.5	3.8–4.4	2.8–3.2
1975	3.5	3.4–3.9	2.4–2.8
1980	3.5	3.1–3.6	2.3–2.6

(2) *"First-year" basis.*—Straight-line depreciation over 35 years. Plant factor 85 percent for both private and public plants.

The percentage charges for capital are as follows:

	Private steam	Private nuclear	Public nuclear
Return	5.5	5.5	2.5
Depreciation	2.9	2.9	2.9
Insurance	.3	.5	.5
Taxes	4.5	4.5	2.2
Total	13.2	13.4	8.1

At 85 percent plant factor the fixed charges are as follows:

[Mills per kilowatt-hour]

	Private steam	Private nuclear	Public nuclear
1960	2.5	3.6–4.3	2.2–2.6
1965	2.5	3.5–4.1	2.1–2.5
1970	2.5	3.2–3.7	1.9–2.2
1975	2.5	2.8–3.2	1.7–2.0
1980	2.5	2.6–3.0	1.6–1.8

(NOTE 1.—The costs used in the preceding section of this memorandum include fixed charges on a lifetime basis only, because this appears to be the method used in the Prentice report.

(NOTE 2.—Cost comparisons of steam and nuclear plants in the Prentice report apparently computed fixed charges at 50 percent plant factor for both types (p. 26), although the report concluded on page 24 that the plant factor would be 43 percent for steam plants and 50 percent for nuclear plants. The latter figures were used in our computations.

(NOTE 3.—The Prentice report (p. 25) computes plant cost per kilowatt-year by using a percentage return on capital and income tax of 10.5 percent, as compared with the 5.5 percent and 2.3 percent used in our computation. Our figures follow FPC practice. Since plant costs of nuclear plants are considerably higher than conventional steam plants, the higher fixed charges used in the Prentice report (16.1 percent in the initial year and 10.9 percent on a lifetime basis) work to the disadvantage of nuclear plants in the comparison with conventional steam plants. Basis for these higher charges is not stated in that report.)

FUEL COSTS

For conventional steam plants the fuel costs were derived from figure 4 (p. 17) for the highest 10 percent and lowest 10 percent of new generating capacity in each of the 5 years, as follows:

[Cents per million B. t. u.]

	1960	1965	1970	1975	1980
Highest 10 percent	36.4	36.8	37.1	37.5	38.5
Lowest 10 percent	17.8	18.9	20.0	21.1	22.5

These were then converted to fuel cost in mills per kilowatt hour by use of net plant heat rate, figure 3 (p. 15), as follows:

[B. t. u.'s per kilowatt-hour]

1960	8,600
1965	8,325
1970	8,050
1975	7,775
1980	7,500

The resulting fuel cost estimates are set forth below together with the estimates of nuclear fuel costs.

For nuclear plants the high and low estimates of fuel costs in each of the five years are taken from figure 2 (p. 11).

Estimated fuel costs for the three types of plants are as follows:

[Mills per kilowatt-hour]

	Private steam	Private nuclear	Public nuclear
1960	1.5-3.1	3.0-3.8	3.0-3.8
1965	1.6-3.1	1.6-3.0	1.6-3.0
1970	1.6-3.0	1.3-2.2	1.3-2.2
1975	1.6-2.9	1.1-1.7	1.1-1.7
1980	1.7-2.9	1.0-1.5	1.0-1.5

OPERATION AND MAINTENANCE

The 1960 and 1980 estimates of these costs at 50 percent plant factor for conventional steam plants (p. 16) and for nuclear plants (p. 12) have been converted to the several plant factors used in this comparison, with interpolations for the intervening years, as follows:

[Mills per kilowatt-hour]

	1960	1965	1970	1975	1980
Conventional steam, 43 percent plant factor	0.9	0.9	0.8	0.7	0.6
Conventional steam, 85 percent plant factor	.5	.4	.4	.4	.3
Nuclear, 50 percent plant factor	1.1	1.0	1.0	.9	.8
Nuclear, 85 percent plant factor	.7	.6	.6	.5	.5

Total costs

[Mills per kilowatt-hour]

I. "LIFETIME" BASIS

	1960	1965	1970	1975	1980
Steam plants, private:					
Fixed charges	3.5	3.5	3.5	3.5	3.5
Fuel cost	1.5–3.1	1.6–3.1	1.6–3.0	1.6–2.9	1.7–2.9
Operation and maintenance	.9	.9	.8	.7	.6
Total	5.9–7.5	6.0–7.5	5.9–7.3	5.8–7.1	5.8–7.0
Nuclear plants, private:					
Fixed charges	4.3–5.2	4.2–4.9	3.8–4.4	3.4–3.9	3.1–3.6
Fuel cost	3.0–3.8	1.6–3.0	1.3–2.2	1.1–1.7	1.0–1.5
Operation and maintenance	1.1	1.0	1.0	.9	.8
Total	8.4–10.1	6.8–8.9	6.1–7.6	5.4–6.5	4.9–5.9
Nuclear plants, public:					
Fixed charges	3.1–3.8	3.0–3.6	2.8–3.2	2.4–2.8	2.3–2.6
Fuel cost	3.0–3.8	1.6–3.0	1.3–2.2	1.1–1.7	1.0–1.5
Operation and maintenance	1.1	1.0	1.0	.9	.8
Total	7.2–8.7	5.6–7.6	5.1–6.4	4.4–5.4	4.1–4.9

II. "FIRST-YEAR" BASIS

Steam plants, private:					
Fixed charges	2.5	2.5	2.5	2.5	2.5
Fuel cost	1.5–3.1	1.6–3.1	1.6–3.0	1.6–2.9	1.7–2.9
Operation and maintenance	.5	.4	.4	.4	.3
Total	4.5–6.1	4.5–6.0	4.5–5.9	4.5–5.8	4.5–5.7
Nuclear plants, private:					
Fixed charges	3.6–4.3	2.5–4.1	3.2–3.7	2.8–3.2	2.6–3.0
Fuel cost	3.0–3.8	1.6–3.0	1.3 2.2	1.1–1.7	1.0–1.5
Operation and maintenance	.7	.6	.6	.5	.5
Total	7.3–8.8	5.7–7.7	5.1–6.5	4.4–5.4	4.1–5.0
Nuclear plants, public:					
Fixed charges	2.2–2.6	2.1–2.5	1.9–2.2	1.7–2.0	1.6–1.8
Fuel cost	3.0–3.8	1.6–3.0	1.3–2.2	1.1–1.7	1.0–1.5
Operation and maintenance	.7	.6	.6	.5	.5
Total	5.9–7.1	4.3–6.1	3.8–5.0	3.3–4.2	3.1–3.8

(NOTE 4.—As noted in our memorandum, the computation of costs for public nuclear plants was conservative in that payments in lieu of State and local taxes were figures at 2.2 percent on capital, whereas FPC recommends p. 1 percent.)

In light of the Charpie report, the computation may be considered conservative also in including nuclear fuel costs ranging from 3.8 mills in 1960 down to 1 mill in 1980, whereas Charpie says zero fuel costs may be achieved.

Charpie also anticipates operation and maintenance costs for nuclear plants no higher than conventional plants, whereas in our computations they are 0.2 mill higher.

Making adjustments for all three of these factors, and recomputing fixed charges and operation and maintenance costs on an 80 percent plant factor basis (to reflect baseload operation of plants with zero fuel costs), the resulting costs for nuclear plants compare with conventional steam plants costs as follows:

	1965	1970	1975	1980
Conventional steam plants, private	6.0–7.5	5.9–7.5	5.8–7.1	5.8–7.0
Nuclear plants, private	3.0–3.5	2.8–3.2	2.5–2.8	2.3–2.5
Nuclear plants, public	1.7–1.9	1.6–1.8	1.5–1.6	1.3–1.4

These are the most optimistic estimates of nuclear power costs that the data in hand permit. When, if ever, they may be achieved is, of course, conjectural. They cannot be considered forecasts, but neither can they be dismissed as outside the range of possibility within this period.

ANACONDA CO.,
ENGINEERING DEPARTMENT,
New York, N. Y., February 24, 1956.

HON. CLINTON P. ANDERSON,
Chairman, Joint Committee on Atomic Energy,
Senate Office Building, Washington, D. C.

DEAR SENATOR ANDERSON: This will acknowledge your letter of February 17, 1956, advising of the opportunity for representatives of industry to present their views to the Joint Committee on Atomic Energy.

We have examined the report of the panel on the impact of the peaceful uses of atomic energy with a great deal of interest.

We have an interest, common to the mining and milling industry in uranium, that would be materially improved by an early and clear-cut determination of the ultimate ownership of fissionable materials and whether the procurement program is to continue beyond its present termination date. Likewise, we feel that there should be a more liberal and accelerated information declassification, also that a field of enormous potential, virtually untapped, is the industrial utilization of atomic energy for process heat.

We believe that we have no further comments at this time.

Your consideration is greatly appreciated.

Yours truly,

WILLIAM JURDEN.

BALTIMORE GAS & ELECTRIC CO.,
Baltimore, Md., February 28, 1956.

HON. CLINTON P. ANDERSON,
Chairman, Joint Committee on Atomic Energy,
Congress of the United States,
Washington, D. C.

DEAR SENATOR ANDERSON: In your letter of February 17, you invite comments concerning the report of the panel on the impact of the peaceful uses of atomic energy.

Our most immediate interest in the atomic-energy program is as a member of the Atomic Power Development Associates, Inc. In open hearing before your committee on February 16, Mr. Walker L. Cisler, president of that organization, outlined the progress being made on the development of a fast-neutron breeder reactor, and indicated some of the problems to be met in achieving economic generation of electric power from atomic energy. We have nothing to add with respect to this specific activity.

As a more general comment, I note the urgent necessity pointed out by the panel that the United States maintain world leadership in the application of atomic energy for electric power generation and for other peacetime purposes. We believe that the contribution which private enterprise can make toward this objective will be enhanced by the establishment, as soon as may be consistent with national security, of the customary freedoms in the buying and selling of special materials, in the protection of inventions by patents, and in business decisions with regard to activities in the atomic-energy field.

We therefore strongly endorse the conclusions and recommendations of section 15.3 of the report of the panel, from which I quote here especially the first recommendation:

"1. That the Joint Committee on Atomic Energy create statutory devices to insure a continuing review of the present policy of Federal ownership of all special nuclear materials in anticipation of the establishment of private ownership."

Your courtesy in giving us an opportunity to express our views is appreciated.

Very truly yours,

CHARLES P. CRANE,
Chairman of the Board and President.

GENERAL PUBLIC UTILITIES CORP.,
New York, N. Y., March 2, 1956.

Hon. CLINTON P. ANDERSON,
Chairman, Congressional Joint Committee on Atomic Energy,
Washington, D. C.

DEAR SENATOR ANDERSON: We appreciate the opportunity afforded by your letter of February 17 to comment on the report of the Panel on the Impact for the Peaceful Uses of Atomic Energy. At present the major activity of our company in the field of atomic energy centers in our interest in the construction of a nuclear power plant in the Philippine Islands. Hence our comments are directed primarily to aspects of the report which have a bearing on our work in connection with a project in the Philippines.

General Public Utilities Corp. is the parent company of five electric utilities which operate in Pennsylvania and New Jersey and it is also the parent of Manila Electric Co., a corporation organized in the Philippines, with operations in and around Manila.

GPU's activity in nuclear power goes back to 1949. In that year I was one of three individuals requested by the AEC to serve on the ad hoc advisory committee on cooperation between the electric power industry and the AEC. The report of that committee was submitted to the AEC in 1951. Later when industry study teams were formed, GPU and some of its subsidiaries became members of what is now known as Atomic Power Development Associates. By early 1955 our work had developed to the point where we felt that, in addition to our participation in APDA, the GPU group should also undertake a separate study of the feasibility of installing a nuclear powerplant on one of our own operating systems. It was clear that from the standpoint of economic feasibility, Manila Electric Co., which has high fuel costs as compared with our domestic operations, presented the most favorable opportunity for installing an atomic powerplant on our system at an early date. Conventional fuels used in the Philippines now cost about 55 cents per million B. t. u. as compared with fuel costs on our domestic system which vary from about 17 to 35 cents per million B. t. u. Therefore, in commencing our separate study last summer we concentrated from the first on the idea of an atomic powerplant in Manila. The substantial progress we have already made in this new effort is described below.

GPU and its predecessors have owned Manila Electric Co. for over 30 years. Since World War II, GPU's problems in managing Manila Electric Co. have been particularly acute. The Manila Co. suffered extensive damage, both during the Japanese occupation and the fighting which finally liberated the Philippines. After the war, GPU assisted the Manila Co. in prompt rehabilitation of its system and in successfully building up its capacity to supply the growing electrical load of the Manila area. Our problems in accomplishing this task and in planning for the future needs of the Manila area have been complicated by the fact that the Securities and Exchange Commission had found it necessary under the Public Utility Holding Company Act of 1935 to order GPU to dispose of its interest in Manila Electric Co. It has not been possible to comply with this divestment order and we do not believe there is a practical way to do so under present conditions without prejudice to the best interests of the Manila Electric Co., its Philippine consumers and the GPU stockholders. This problem can only be cured by appropriate legislation and such legislation is under consideration. Meanwhile, because of the long lead time involved in planning and constructing new capacity, GPU has had to proceed with plans for meeting new load requirements in the Philippines. Conventional fossil fuel plants of Manila Electric Co. now under construction or authorized are expected to take care of needs through 1958. Recent engineering studies indicate that still further capacity will be required by it for 1959 or 1960 and our hope is this need can be met by a nuclear plant.

We have made substantial progress on the Manila nuclear power project. We have located a promising site; we have drawn up the specifications for a nuclear powerplant; and we have asked for bids on the manufacture of a nuclear power reactor. We should like to make it clear that our thinking with respect to this nuclear powerplant has been that it would be financed by private capital in a manner similar to a conventional fuel plant.

Preliminary investigation shows that a site not farm from Manila and naturally isolated from populated areas, would be suitable for the project and could be readily integrated into the Manila Electric system. During 1955 we had several preliminary meetings with a number of equipment manufacturers and

in January 1956 we formally invited bids and proposals from 4 of the major equipment manufacturers for a nuclear steam generator with an electrical capacity of 60,000 kilowatts. The invitation requires that proposals be submitted by June 1, 1956.

Until proposals have been received and evaluated, we cannot tell whether or by what date it may prove economically feasible to construct a nuclear powerplant in the Philippines. Furthermore, while the proposals we receive will establish some of the major elements of the cost of a nuclear plant, there are other elements of cost which will have to be established before a decision can be reached to proceed with construction. Of these we consider the most troublesome to be the cost of return shipment and chemical reprocessing of irradiated fuel elements. We have begun discussions with private shipping interests about the cost of transporting irradiated fuel. At present, however, there are no private facilities capable of reprocessing nuclear fuel, and until such facilities are available we will have to rely on the AEC to do the reprocessing. We believe that determination by the AEC of the conditions and prices which will govern this work is necessary before we can finally evaluate the project.

We recognize, of course, that a nuclear powerplant can be constructed by Manila Electric Co. only after an appropriate agreement for cooperation has been made between the United States and Philippine Governments. We have already had preliminary discussions with the Philippine Government and hope that negotiation of the agreement will take place at an early date.

Two recommendations contained in the panel report are of particular importance to us. One of these relates to the supply of nuclear fuel to foreign reactor projects. The other concerns declassification of reactor technology.

We are greatly encouraged by the panel's recommendation that the United States should "announce that it is prepared to furnish nuclear fuel * * * for the installation of at least 1 million kilowatts of atomic generating capacity outside the United States as soon as possible." The President's recent announcement of an allocation of 20,000 kilograms of U–235 for foreign reactor projects is another welcome step. As we understand the President's announcement and the companion announcement by the Chairman of the Atomic Energy Commission, material will be set aside for specific foreign reactor projects to meet their full fuel requirements during the life expectancy of such projects. The reactor types presently being considered for the Manila project are all expected to require an enriched uranium fuel and we regard long-term commitments by the United States Government for fuel supply as indispensable to the project. Without such commitments neither the recommendation of the panel nor the announcement of the President will be effective.

Two important unknowns are the price to be charged for fuel for foreign reactors and the amounts to be paid for plutonium or U–233 produced in them. We are hopeful that these prices will be fixed and announced in time to permit us to proceed with the evaluation of bids as soon as we receive them from the equipment manufacturers.

There are other conditions, also yet to be determined by the Government, which will affect the Manila project. Among these are restrictions on the level of fuel enrichment and requirements respecting return and reprocessing of spent fuel. We do not yet know whether or to what extent limiting the enrichment of fuel will affect the economics of our project, and we are not aware of any adequate technical and economic studies on the subject. We have asked the equipment manufacturers to include in their proposals designs based on optimum fuel enrichment as well as designs based on fuel enrichment not exceeding 20 percent. It is possible that it will prove more economical to use a natural uranium fuel "seeded" with highly enriched uranium than to use fuel elements with a more limited enrichment. We hope that any limitations on enrichment which may be established by the AEC will be flexible enough to permit adjustment to the economics of our project.

As to reprocessing of nuclear fuel, we do not expect that there will be facilities for this work in the Philippines for some years to come. We, therefore, have no objection to the panel's recommendation that foreign atomic powerplants be subject to "interim control plans" requiring return and reprocessing of spent fuel for recovery of plutonium or U–233 in the United States. The requirement ought to be flexible enough, however, to permit the storage of irradiated fuels in the Philippines during a cooling-off period and to permit permanent disposal of spent fuel in the Philippines in the event that the cost of returning and reprocessing exceeds the value of the material to be recovered.

The second panel recommendation of special interest to us is the proposal that the AEC declassify all reactor technoolgy, including fuel element fabrication and processing techniques, except information of military significance. We strongly favor this recommendation. Declassification will greatly facilitate the transmission of technical and cost information to the Philippines and will contribute to the feasibility of proceeding with the project. We are naturally concerned not only with information needed for the construction and initial operation, but also with subsequent advances in reactor technology which can contribute to safety, efficiency, and reliability of the plant. Manila Electric needs to be in a position to take advantage, for example, of new techniques in fuel fabrication or reprocessing that might reduce the cost of operation.

If your committee desires any additional information about our work in the atomic power field we will, of course, be glad to furnish it.

Sincerely,

E. W. MOREHOUSE, *Vice President*

FEDERATION OF AMERICAN SCIENTISTS,
Washington, D. C., March 5, 1956.

Hon. CLINTON P. ANDERSON,
Chairman, Joint Congressional Committee on Atomic Energy,
Capitol Building, Washington 25, D. C.

DEAR SENATOR ANDERSON: On behalf of the executive committee of the Federation of American Scientists, I should like to ask permission to have the enclosed statement inserted into the record of the hearings now being conducted by your committee on the report of the panel on the impact of the peaceful uses of atomic energy.

We have been unable to arrange for a representative to testify at these hearings, but the enclosed statement, approved by our national council at its February 3 meeting, represents the Federation's views in this important matter.

Respectfully yours,

LOTHAR W. NORDHEIM, *Vice Chairman.*

STATEMENT ON THE REPORT OF THE PANEL ON THE IMPACT OF THE PEACEFUL USES OF ATOMIC ENERGY, APPROVED BY THE COUNCIL OF THE FEDERATION OF AMERICAN SCIENTISTS, MEETING AT COLUMBIA UNIVERSITY, FRIDAY, FEBRUARY 3, 1956.

The Council of the Federation of American Scientists welcomes the report by the McKinney panel on the peaceful uses of atomic energy, which brings into focus the status of current atomic-energy development. The Joint Congressional Committee on Atomic Energy is to be congratulated for having initiated this inquiry.

Of the many excellent recommendations in the report, the FAS wishes, in particular, to endorse the following:

1. *Freer flow of information.*—The panel urges the abolition of the present dual system of information control, one for atomic and one for defense information. It recommends that only military applications remain protected by the classification system. The concept that all atomic information is born classified is not compatible with the expeditious action required for full development of the immense peaceful potential of atomic energy.

2. *Controlled thermonuclear power.*—The panel recommends "that the Atomic Energy Commission, with the limitations which national security considerations impose, permit the maximum interplay of scientific and engineering ideas * * *"

Such authoritative voices as those of former Atomic Energy Commissioner H. D. Smyth, present Chairman Clinton Anderson of the Joint Congressional Atomic Energy Committee, and former AEC Chief of Declassification J. G. Beckerley have expressed the opinion that declassification of the thermonuclear power field would not endanger, but would rather promote, the national security.

The development of controlled thermonuclear power constitutes a vast technological problem of extreme complexity, whose solution cannot be expected in the near future. What is needed is a multitude of new ideas and the exploration of many areas of basic science. The FAS believes that secret research in selected laboratories offers the poorest promise for rapid progress in this field. The traditional interplay of the actions of many free minds offers a much better prospect for success in this most challenging developmental problem of our times.

The action by the Atomic Energy Commission on February 3, 1956, in making fusion data available to those with access permits, will increase participation in this field but cannot replace the wider discussion which would result from declassification of this material. Until the "Restricted Data" label is removed, the open and uninhibited discussion of the basic problems—which is necessary for their early solution—will be impossible.

3. *Atomic energy relations with foreign countries.*—The panel stresses the need for cooperation with friendly countries and of our active support of atomic energy programs, and proposes that the AEC center its responsibilities in this respect in one alert, forward-looking organizational unit.

The President has provided our country with inspiring leadership in his concept of the atoms-for-peace plan, but there is real need at this late date for its imaginative and vigorous administration—lest much of the value of his proposal be lost.

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE,
PUBLIC HEALTH SERVICE,
Washington, D. C., March 13, 1956.

Hon. CLINTON P. ANDERSON,
Chairman, Joint Committee on Atomic Energy,
United States Senate.

DEAR MR. CHAIRMAN. Your invitation of February 17, 1956, to comment on the excellent report of the panel on the peaceful uses of atomic energy is deeply appreciated.

As an overall comment, the Public Health Service is in complete agreement with a fundamental premise of the report which encourages various Federal agencies and the States to develop programs for dealing with their respective interests in the expanding atomic-energy program.

Primary interests of the Public Health Service are the beneficial applications of atomic energy to public health and medicine as well as in radiation protection. We have noted for comment, statements and recommendations in the report which affect these interests through Federal-State relationships; support of research; augmentation of training courses and facilities; development of adequate radiation protection programs by the States; and the discharge of Federal responsibilities in public health, generally, and in the fields of water and air pollution. In working relationships with the Atomic Energy Commission, the Public Health Service has recognized these factors, which are becoming more important as the civilian industry develops.

Dealing with specific recommendations in the order in which they appear in the report, we offer the following comment:

Section 4.5

"6. Inaugurate a nationwide educational program on the more judicious use of radiation and the need for better recordkeeping of the exposure of individuals to radiation from all sources."

In addition to the positive health protection which would be provided by implementing this recommendation, data from exposure records are of value for epidemiologic studies of radiation injury. State health agencies can assist in this program.

Section 12.4

"1. That basic research in universities be given generous support, both in funds and facilities, through all normal channels to insure continued expansion of fundamental knowledge in the fields related to the peaceful uses of atomic energy."

Public Health Service research grants are a normal channel through which increasing support is being given to universities for basic research and for applied studies on the medical and public health uses of atomic energy. Health problems associated with widespread uses of this form of energy also intensify the need for research to increase our knowledge of the effect of radiation on man and of the distribution of radioactivity in the environment.

Section 12.9

"1. The encouragement of orderly and determined efforts on the part of all concerned to increase the output and improved the quality of scientists and engineers capable of contributing to the development of peacetime atomic uses."

Training of professional and technical personnel is clearly one of the most critical issues facing the development of the peaceful uses of atomic energy. Public Health traineeships and fellowships are designed to help alleviate the critical shortage of research scientists. Public Health, medical, and engineering schools must give increased emphasis to radiological health in their curriculums. The short, in-service orientation courses in radiological health for State health personnel conducted by the Public Health Service have been oversubscribed regularly. Moreover, State requirements are now expanding to include operational training in radiological health methods.

We feel that the following statements in paragraph 14.3 need special comment:

"State public health services are already engaged in the education, training, inspection, and other public health protection functions which stem from the expansion of industrial participation in the peaceful uses of atomic energy. * * *

"The role of licensees in meeting the waste disposal problem is less clear. Certainly Government must regulate such disposal to protect public health."

Thus far, State public health agencies have been able to undertake only limited activities in radiological health; their programs have seldom extended beyond maintaining a general knowledge of isotope utilization from AEC reports and, in some States, the inspection of X-ray and radium installations. The States are not prepared to cope with the greatly expanded health responsibilities associated with the construction of the commercial reactors. Therefore, we feel that some way should be found for States to acquire the necessary knowledge and experience to meet their problems.

Section 15.3

"3. That the Commission, and other appropriate Federal departments and agencies, work with State and local authorities to establish uniform safety and health regulations and enforcement relating to peaceful uses of atomic energy."

National Bureau of Standards Handbook 61, "Regulation of Radiation Exposure by Legislative Means," developed with Public Health Service participation, constitutes a good basic guide for State and local programs. Much remains to be done, however, to develop operational methods and standards which will provide health protection and still be feasible for the industry.

Section 18.6

"2. That other departments and agencies of the executive branch be encouraged to develop their own organizations for dealing with their functional interests in peaceful uses of atomic energy, drawing upon the Commission for advice and services rather than leaning on the Commission or delegating their functions to it."

For over 30 years, the Public Health Service has been interested in the health aspects of radiation. The National Institutes of Health have been our principal center for basic and applied studies on the biological effects of atomic energy and on its applications in medical practice. Public health activities, including applied research, performance of radiological safety operations, technical assistance and consultation to other Federal agencies and States, training of personnel, and dissemination of information, are conducted through our Bureau of State Services.

Following passage of the Atomic Energy Act of 1954, we have given increasing attention to the role of health agencies in relation to the civilian uses of atomic energy. To the extent that our resources have permitted, and consistent with legal authority, we have developed some competency in radiation protection and other health and medical aspects of atomic energy. Working relationships have been established in this connection, particularly with the Atomic Energy Commission's Divisions of Civilian Application, Reactor Development, and Biology and Medicine. We are thus developing the broader program needed for dealing with our functional interests in the peaceful uses of atomic energy.

Sincerely yours,

LEONARD A. SCHEELE,
Surgeon General.

DEPARTMENT OF THE INTERIOR,
BONNEVILLE POWER ADMINISTRATION,
Portland Oreg., March 6, 1956.

Hon. CLINTON P. ANDERSON,
Chairman, Joint Committee on Atomic Energy,
United States Senate, Washington, D. C.

MY DEAR SENATOR ANDERSON: Your letter of February 17, 1956, advising of the opportunity for representatives of industry to express their views regarding peaceful uses of atomic energy is appreciated. Due to previous commitments it does not appear possible for anyone from our organization to appear before your committee at this time. However, we should like to present our views on this subject.

The use of atomic energy for the generation of large blocks of power is of great interest to us as a transmission and marketing agency, and we are sure it will ultimately have a profound influence on the development and operation of large power systems. Our interests, as well as those of other utilities in the Pacific Northwest, however, tie in more closely with the long-range development rather than any immediate large-scale application of atomic energy to the generation of electricity. We are following this development very carefully, as we believe nuclear power is destined eventually to become an important supplement to the large hydro resources now supplying practically all the electric energy used in the Pacific Northwest.

If all major hydro potential in this region is developed as needed, it will supply the estimated energy requirements to about 1975. Due to economic feasibility and conflict of interests, such as migratory fish, navigation and irrigation, some of the hydro potential may never be developed, and some sites may be delayed for many years. If the projects now considered to be economically competitive are all developed when required, they will supply the estimated needs of the region to between 1970 and 1975. A certain amount of thermal firming capacity is desirable and should be in operation before that time.

Since the Pacific Northwest does not have large reserves of oil or gas, and the coal reserves are of relatively low quality, fuel cost for conventional thermal electric generating plants will be high, probably not less than 30 to 40 cents per million B. t. u.'s even in large quantities. We are convinced that the cost of producing electric energy through the use of nuclear fission will gradually come down, while the cost of hydro energy will continue to increase after the low-cost sites have been developed. It appears at present that incremental hydro costs may reach the conventional-thermal level in this area in 15 to 20 years. By that time several generations of power reactors will have been constructed and nuclear power should be competitive. We should then be prepared to move vigorously toward its adoption.

Sincerely yours,

E. C. STARR, *Chief Engineer.*

WESTON, MASS., *March 5, 1956.*

Senator CLINTON P. ANDERSON,
Chairman, Joint Committee on Atomic Energy,
Congress of the United States, Washington, D. C.

DEAR SENATOR ANDERSON: I regret very much that it was not possible for me to testify at the public hearings on March 5 and 6. I feel very strongly about the desirability of declassifying all information on nonmilitary reactors and heartily endorse the recommendation of the McKinney panel to this effect. I should like to have testified on this point.

Sincerely yours,

MANSON BENEDICT.

Chairman ANDERSON. This will conclude the hearings and I want to thank all of you for participating.

(Whereupon, at 4: 15 p. m., the committee adjourned.)

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